



DRAFT
FEASIBILITY STUDY
REPORT

Riverside Industrial Park
Superfund Site
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Appendix A:	Soil Area/Volume Delineation Information
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LIST OF ACRONYMS

Acronym	Definition
ABSd	Dermal Absorption Fraction
ACO	Administrative Settlement Agreement and Order on Consent
AEC	Area of Environmental Concern
ALM	Adult Lead Methodology
AMSL	Above Mean Sea Level
AOC	Area of Concern
ARAR	Applicable or Relevant and Appropriate Requirements
AST	Aboveground Storage Tank
BBI	Baron Blakeslee, Inc.
BER	Baseline Environmental Risk
bgs	Below Ground Surface
BHHRA	Baseline Health Human Health Risk Assessment
Birdsall	Birdsall Services Group
BLL	Blood Lead Level
BN	Base Neutral
BTEX	Benzene, Toluene, Ethylbenzene, Xylenes
CCI	Chemical Compounds, Inc.
CEA	Classification Exception Area
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CFR	Code of Federal Regulations
cm/s	Centimeter per Second
COC	Chemical of Concern
COEC	Chemicals of Ecological Concern
COPC	Chemicals of Potential Concern
COPEC	Chemicals of Potential Ecological Concern
CRS	Cultural Resource Survey
CY	Cubic Yard
DASRAT	Development and Screening of Remedial Alternatives Technical
Davion	Davion Inc.
DCE	Dichloroethene
DER	Declaration of Environmental Restriction
DNAPL	Dense Non-Aqueous Phase Liquid
ECRA	Environmental Cleanup Responsibility Act
EPCs	Exposure Point Concentrations
ESV	Ecological Screening Value
Federal	Federal Refining Company
First Environment	First Environment, Inc.
FS	Feasibility Study

Acronym	Definition
Frey	Frey Industries
ft/day	Feet per Day
Gloss Tex	Gloss Tex Industries, Inc.
GWQS	Groundwater Quality Standard
HABA	HABA International, Inc.
HI	Hazard Index
Honeywell	Honeywell International, Inc.
HQ	Hazard Quotient
ICT	Identification of Candidate Technologies
IDA	Industrial Development Associates/Corporation
IEUBK	Integrated Exposure Uptake Biokinetic Model
IGWSSL	Impact to Groundwater Soil Screening Level
ISRA	Industrial Site Recovery Act
LDR	Land Disposal Restriction
LNAPL	Light Non-Aqueous Phase Liquid
LSRP	Licensed Site Remediation Professional
MCL	Maximum Contaminant Level
MEK	Methyl Ethyl Ketone
MIBK	methyl isobutyl ketone
mg/kg	Milligram per Kilogram
mg/L	Milligram per Liter
MNA	Monitored Natural Attenuation
MSL	Mean Sea Level
MTBE	Methyl Tert-Butyl Ether
NAPL	Non-Aqueous Phase Liquid
NCP	National Contingency Plan
NFA	No Further Action
ng/kg	Nanograms per Kilogram
N.J.A.C.	New Jersey Administrative Code
NJDEP	New Jersey Department of Environmental Protection
NRDCSRs	Non-Residential Direct Contact Soil Remediation Standard
NV5	NV5, Inc.
O&M	Operation and Maintenance
OSHA	Occupational Safety and Health Administration
OSWER	Office of Solid Waste and Emergency Response
PAH	Polycyclic Aromatic Hydrocarbons
PAL	Project Action Level
PAR	Preliminary Assessment Report
PCB	Polychlorinated Biphenyl
PCE	Tetrachloroethylene

Acronym	Definition
PHC	Petroleum Hydrocarbons
PI	Primary Identification
PMK	PMK Group, Inc.
POTW	Publicly Owned Treatment Works
PPG	PPG Industries, Inc.
ppm	Parts per Million
PRG	Preliminary Remediation Goals
PVSC	Passaic Valley Sewer Commission
RAO	Remedial Action Objectives
RAP	Remedial Action Permit
RAWP	Remedial Action Work Plan
RBC	Risk Based Concentrations
RCRA	Resource Conservation and Recovery Act
RfC	Reference Concentration
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
RIP	Riverside Industrial Park
RIR	Remedial Investigation Report
RME	Reasonable Maximum Exposure
ROD	Record of Decision
Roloc	Roloc Film
RPD	Relative Percent Difference
RSL	Regional Screening Levels
Samax	Samax Enterprises
SCSR	Site Characterization Summary Report
SF	Square Foot
Site	Riverside Industrial Park Superfund Site
SLERA	Screening Level Ecological Risk Assessment
SRP	Site Remediation Program
SRS	Soil Remediation Standards
SSDS	Subsurface Depressurization System
SVE	Soil Vapor Extraction
SVOC	Semivolatile Organic Compound
SY	Square Yard
TBC	To Be Considered
TCDD	Tetrachlorodibenzoparadioxin
TCA	Trichloroethane
TCE	Trichloroethene
TCLP	Toxicity Characteristics Leaching Procedure
Tetra Tech	Tetra Tech Inc.



Acronym	Definition
TEX	Toluene, Ethylbenzene, Xylene
TIC	Tentatively Identified Compound
TMV	Toxicity, Mobility, or Volume
TPH	Total Petroleum Hydrocarbon
TSCA	Toxic Substances Control Act
TSD	Treatment, Storage or Disposal
TWP	Temporary Well Point
UCL	Upper Confidence Level
µg/dL	Microgram per Deciliter
µg/kg	Microgram per kilogram
µg/L	Microgram per Liter
µg/m ³	Microgram per Cubic Meter
USEPA	U.S. Environmental Protection Agency
UST	Underground Storage Tank
VIT	Vapor Intrusion Technical Guidance
VOC	Volatile Organic Compound
WRA	Well Restriction Area



EXECUTIVE SUMMARY

Introduction

This report presents the results of the Feasibility Study (FS) conducted at the Riverside Industrial Park Superfund Site (the Site) located in Newark, Essex County, New Jersey. The FS was conducted in accordance with the Administrative Settlement Agreement and Order on Consent (ACO) (Comprehensive Environmental Response, Compensation, and Liability Act of 1980 [CERCLA] Docket No. 02-2014-2011) and prepared on behalf of PPG Industries (PPG). The FS conducted under this Settlement Agreement is subject to approval by U.S. Environmental Protection Agency (USEPA).

The Final Remedial Investigation Report (RIR) (Woodard & Curran, Inc. [Woodard & Curran], April 2020) provides data collected in the remedial investigation (RI) for the development of remedial alternatives in the FS. The FS follows the Identification of Candidate Technologies (ICT) Memorandum (Woodard & Curran, June 12, 2019) which is an initial analysis of potential candidate remedial technologies. The Development and Screening of Remedial Alternatives Technical (DASRAT) Memorandum (Woodard & Curran, August 28, 2019) further refined the candidate technologies using site characterization information and USEPA's comments on the ICT Memorandum to develop and screen alternatives to be retained for detailed analysis in the FS. This FS Report further evaluates, refines, and analyses the remedial alternatives presented in the DASRAT Memorandum.

The FS was conducted to identify and evaluate appropriate methods for controlling concentrations of chemicals of potential concern (COPCs) documented in the affected environmental media associated with the Site. To provide for the development of appropriate response actions, the FS lists the Remedial Action Objectives (RAOs) from the RIR, defines specific Preliminary Remediation Goals (PRGs) to meet the RAOs, and provides detailed analysis of appropriate remedial alternatives. The remedial alternatives are designed to:

- Provide permanent protection of human health and the environment;
- Comply with applicable or relevant and appropriate requirements (ARARs) of Federal, State and local environmental laws within a reasonable timeframe;
- Be cost-effective; and
- Satisfy the preference for treatment that reduces contaminant toxicity, mobility, or volume (TMV).

Remedial action alternative development and screening considered:

- Site characterization results as presented in the RIR (Woodard & Curran, April 2020);
- Determination of risk for the Site as documented in the *Final Baseline Human Health Risk Assessment* (BHHRA) (Ramboll US Corporation [Ramboll], 2020a) and *Final Screening Level Ecological Risk Assessment* (SLERA) (Ramboll, 2020b);
- Federal and State regulations that are ARARs;
- PRGs/RAOs; and
- Current site conditions.

In accordance with USEPA protocols, this FS Report provides information for decision-makers to compare alternatives and develop a Proposed Plan identifying the agency's preferred alternative and the rationale for its preference. After consideration of public comment, USEPA will issue a Record of Decision (ROD) setting forth the selected remedy.

Site Location and Description

The Site is a 7.6-acre active industrial site, previously owned by Patton Paint Company until 1971 and located in Newark, Essex County, New Jersey. After 1971, the Site was subdivided into 15 parcels/lots, and is identified as the Riverside Industrial Park (RIP). The lots in the northern portion of the Site have Riverside Avenue addresses (Lots 1, 57, 58, 59, 60, 69, and 70), while the lots in the southern portion of the Site have McCarter Highway addresses (Lots 61, 62, 63, 64, 65, 66, 67, and 68). Both Riverside Avenue and McCarter Highway border the Site to the west along with a segment of railroad track adjacent to McCarter Highway. Vehicle access is from Riverside Avenue. Much of the surface area of the Site is covered by buildings or pavement. The Passaic River and tidal mudflat border the Site on the east side. A steel, concrete, or wooden bulkhead provides a retaining wall along most of the Site adjacent to the Passaic River; however, the bulkhead has fallen into disrepair in some locations and is collapsed in several sections.

There are 14 buildings at the Site with five of the buildings being vacant (Buildings #6, #7, #12, #15, and #17). At the time of the RI, Buildings #1, #2, #3, #9, #10, #13, #14, and #16 had ongoing business operations, and a small garage building (Building #19) was used for storage by the occupant of Building #13. Portions of Lot 64 and former Building #4 had vehicle dismantling activities during some of the RI activities.

Site History

The site history is presented in the Site Characterization Summary Report (SCSR) (Woodard & Curran, 2015). The majority of the Site was reclaimed from the Passaic River with imported fill. An 1892 Certified Sanborn Map suggests that some filling occurred in the late 1800s; however, the major filling events at the Site occurred from 1892 to 1909. The origin of fill material at the Site is unknown.

The Site housed paint and varnish manufacturing operations from approximately 1902 until 1971. Since then, the Site has continued to be used for a wide variety of industrial purposes by a multitude of companies and was subdivided into 15 parcels/lots. Buildings #4 and #5 are no longer present at the Site as a result of a fire in approximately 1982 which caused significant damage and resulted in the building remnants being demolished. Several of the site lots have deed notices regarding engineering controls (pavement surface cover) related to New Jersey's remediation program (Figure 2-2). Pre-RI site investigations related to these deed notices are discussed in Section 2.3 along with other notable investigations completed through the state remediation program or by USEPA-retained contractors/consultants.

At the time of the RI, Buildings #1, #2, #3, #9, #10, #13, #14, and #16 had ongoing business operations. Portions of Lot 12 and the former Building #4 slab had vehicle dismantling activities during some of the RI.

Remedial Investigation

The Remedial Investigation/Feasibility Study (RI/FS) Work Plan (Woodard & Curran, 2017) was developed based on existing data presented in the SCSR. The RI/FS Work Plan was approved by USEPA in August 2017 which initiated the Phase 1 field site reconnaissance, geophysical survey, building safety assessment, bulkhead wall assessment, soil investigation, groundwater investigation, waste container investigation, indoor air investigation, sump and sewer investigation, and Cultural Resource Survey (NV5, Inc., 2017). After the Phase 1 RI activities were completed in October 2018, an SCSR Addendum (Woodard & Curran, 2018) was prepared. This document presented the Phase 1 results and was conditionally approved with comments on May 16, 2019 by USEPA. USEPA's comments regarding the SCSR Addendum are incorporated in the RIR as agreed to with USEPA.

Phase 2 RIR field activities began in December 2018 and included additional soil and groundwater investigation using the Phase 1 results to identify data gaps and to provide greater special coverage of the Site. Sample collection,



analyses, validation, and reporting for Phase 2 were in accordance with the RI/FS Work Plan and results were documented in the RIR. The RIR BHHRA and SLERA were approved by USEPA on April 21, 2019.

Physical Setting

The majority of the Site is paved or under roof. The topographic survey map of the Site (RIR, Figure 3-2A) shows ground surface elevations ranging from approximately 6 to nearly 12 feet above mean sea level (AMSL), with between 40 and 50 percent of the Site within the 100-year floodplain of the Passaic River. The top of the river bulkhead is between 6 and 7 feet mean sea level (MSL).

Up to 15 feet of fill exists beneath the Site. The sources of fill are unknown. As fill placement occurred over a more than 30-year period, the sources and thus physical and chemical properties could be different. The fill material consists predominantly of sands, silts, and gravel along with man-made materials such as brick, pieces of concrete block, wood, glass, and cinders. The fraction of each material in the fill varies across the Site. This material is considered "historic fill" as it complies with the New Jersey Department of Environmental Protection (NJDEP) definition of historic fill. Historic fill in some areas appears to have been impacted due to historical and/or current operations and chemical/waste handling at the Site. Lower portions of the fill are saturated as evidenced by groundwater depths that are typically less than 6 feet below grade.

A silt loam underlies the fill unit over the majority of the Site except in areas to the northwest. The silt loam is underlain by alluvium deposits.

Two groundwater units were investigated: shallow fill and deep. Shallow groundwater is within the fill material, and deep groundwater is within native materials. The primary groundwater flow direction in the shallow fill unit and deep unit is to the east toward the Passaic River.

Evaluation of slug test data for shallow fill unit wells at the Site indicated hydraulic conductivities between approximately 4 to 235 feet per day (ft/day). While the data indicate a range of approximately three orders of magnitude for hydraulic conductivity, the fact that these wells are constructed in fill materials suggests this range is reasonable given the heterogeneity of fill. Slug test data for wells in the deep unit wells indicated higher hydraulic conductivities in the north (162 to 264 ft/day) compared to hydraulic conductivities in the south (4 to 84 ft/day).

Groundwater elevations are and were typically influenced by tidal changes which are greatest in areas adjacent to the river. Tidal influences were observed in both the shallow fill unit and deep unit and appear to be greater in the northern portion of the Site than the southern portion. This influence results in groundwater with elevated conductivity values and elevated concentrations of sodium and other salts as reported in the RIR, which are indicative of saltwater intrusion.

Nature and Extent of Contamination

In the assessment of nature and extent, sample analytical results were compared to Project Action Levels (PALs) or other screening values such as hazardous waste characteristics. Exceedance of a PAL does not indicate an unacceptable risk to that media. PALs are screening values that can help decision makers target a course of action prior to the risk assessment.



Waste

There are a limited number and volume of waste containers and materials (not associated with current operations) observed and sampled in the RI. The wastes are not characterized as hazardous wastes based on RI results. Light non-aqueous phase liquid (LNAPL), identified as diesel/heating oil, is present in an underground storage tank (UST) (Lot 64) and Building #15A (Lot 58). Surface waste piles on the southern portion of the Site and Building #7 asbestos-containing materials were removed by USEPA during the RI but were not part of the RI.

Six USTs were identified in a tank field north of Building #12. All six USTs contained liquid that was sampled; five tanks did not contain liquids identifiable as a product or waste product, and groundwater and/or surface water infiltration may have occurred. Because UST volatile organic compound (VOC) concentrations from five USTs are higher than nearby groundwater, these tank contents remain a potential source of groundwater contamination.

Based on results, Building #15 standing water was not considered a waste. Water and a viscous non-aqueous phase liquid (NAPL) layer approximately 0.5-foot to 0.65-foot thick were found beneath a steel-grated floor in a portion of Building #15A (pump house). NAPL constituents are consistent with diesel/heating oil.

Soil

Observations of a thick, oil-like substance were noted at Borings B-34, B-35, and B-90 east and south of the UST area. Monitoring wells in the vicinity of the USTs did not have a measurable thickness of NAPL; however, a temporary well point (TWP) installed at B-34 contained LNAPL. Isolated areas of LNAPL staining were also observed in soil during the drilling of Monitoring Well MW-201 between the ground surface and 7.2 feet below ground surface (bgs). Monitoring wells in this area of the Site (including Monitoring Well MW-201) did not have a measurable thickness of LNAPL.

Eight VOCs were identified as soil COPCs in the BHHRA. The VOCs that exceeded a PAL most frequently were benzene, methylene chloride, tetrachloroethylene (PCE), and trichloroethene (TCE). Although toluene, ethylbenzene, and xylene (TEX) (total) were reported at elevated concentrations, most results were below their PALs. The source of benzene, toluene, ethylbenzene, and xylenes (BTEX) on Lots 63 and 64 is likely the petroleum waste in USTs and soil and recent illegal storage or recent dumping. The highest chlorinated VOC results were from Lot 68 where a PCE release occurred in 1987. BTEX was also reported in that area. The likely source of these VOCs is illegal dumping and residual contamination from the PCE spill. BTEX and chlorinated VOCs were detected around Building #15. The likely source is recent spills in the area. Elevated acetone concentrations were reported in subsurface soil on Lot 57, but the results were less than 60 percent of the acetone PAL. The source of acetone is likely the acetone storage area or the building where it is used (Building #10).

Eight SVOCs were identified as COPCs in the BHHRA. SVOCs above a PAL were widespread with the majority being on Lots 63, 64, 67, and 68 and in surface soil. Benzo(a)pyrene was the SVOC with the most PAL exceedance. Of the SVOCs detected above PALs, benzo(a)pyrene and dibenzo(a,h)anthracene have the lowest PAL at 110 micrograms per kilogram ($\mu\text{g}/\text{kg}$). The source of the SVOCs above PALs is likely historic fill, which may have been impacted by illegal petroleum material spills/storage, petroleum waste in USTs, and surrounding area historical/current operations.

Twenty-four metals including mercury were analyzed in soil samples. The highest lead and zinc soil concentrations were generally on Lots 63, 64, and 70. The majority of zinc concentrations were below PAL on these lots and the other 12 lots. Mercury was detected in the majority of soil samples above its PAL (0.1 milligrams per kilogram [mg/kg]) with most PAL exceedance on the southern portion of the Site. The source of the metals is likely historic fill, which may have been impacted by operations releases, and illegal dumping.

Polychlorinated biphenyl (PCB)-1254 exceedances were mostly concentrated on the southern portion of the Site in Lots 63, 64, and 65. PCB-1260 exceedances were almost entirely from surface samples collected in the northern portion of the Site and were found on Lots 58, 69, and 70. An NJDEP-led PCB soil excavation occurred on Lot 70.

No pesticides/herbicides, except heptachlor epoxide, were detected in soil samples.

Groundwater

Shallow unit monitoring wells were sampled during three events except for Monitoring Well MW-124 which was installed in Phase 2 and sampled once. Monitoring wells in the deep unit were sampled once. The number of parameters above PAL is less in the deep unit groundwater than in the shallow fill unit. Concentrations were also lower in the deep unit.

The groundwater areas with the highest concentrations above PALs are as follows:

- Lots 63/64
- Lot 58/Building #15
- Lot 57/Building #10

The first two areas above are contaminated with BTEX and chlorinated solvents. Lot 57 contamination is primarily acetone. Arsenic and lead concentrations above PALs are site-wide with the most exceedances on Lots 63/64. 1,4-Dioxane concentrations above PAL were primarily along the river.

Results are summarized as follows:

Shallow Unit VOCs: Benzene detections were the most common VOC to exceed the PALs in the shallow fill unit, followed by vinyl chloride, ethylbenzene, 1,1,2-trichloroethane (TCA), 1,1,2,2-tetrachloroethane, and m,p-xylenes. Fourteen VOCs including benzene, vinyl chloride, ethylbenzene, 1,1,2-TCA and xylenes (total) are groundwater COPCs in the BHHRA.

Shallow Unit SVOCs: 1,4-Dioxane was the most common SVOC detected (above PALs) followed by naphthalene, benzo(a)anthracene, benzo(a)pyrene, and 1,1'-biphenyl in the shallow fill unit. Twelve SVOCs were identified as COPCs.

Shallow Unit Metals: Arsenic, manganese, iron, sodium, cyanide and lead were detected most often above their respective PALs. Mercury was not detected above its PAL. Eight other metals were detected above their PALs in at least one sampling event.

Shallow Unit PCBs: Aroclor 1260 was detected in groundwater above its PAL at four shallow fill unit well locations during at least one sampling event (MW-108, MW-118, MW-119, and MW-121). One other PCB (Aroclor 1254) was detected above its PAL in one sampling event.

Shallow Unit NAPLs: Measurable LNAPL was not observed in a shallow fill unit monitoring well. LNAPL was observed in soil in the area of Lot 64 USTs. No dense non-aqueous phase liquid (DNAPL) was observed in the RI monitoring wells.

Deep Unit VOCs: Benzene, 1,1,2,2-tetrachloroethane, and 1,1,2-TCA were the most common VOCs to exceed their PAL in the deep unit groundwater. The methyl tert-butyl ether (MTBE) PAL exceedance is unique to the deep unit as it was not detected in a shallow fill unit well above its PAL. Ten VOCs including MTBE were identified as deep unit COPCs in the BHHRA.

Deep Unit SVOCs: In the deep unit groundwater, naphthalene was the most common SVOC detected exceeding its PAL. Three SVOCs were identified as COPCs in the BHHRA.

Deep Unit Metals: Arsenic, manganese, and sodium were detected most often above their respective PALs in deep unit groundwater. Eight metals were identified as COPCs in the human health risk assessment.



Deep Unit PCBs: No PCBs were detected in deep unit groundwater.

Deep Unit NAPLs: LNAPLs or DNAPLs were not observed in a deep unit monitoring well.

Sumps

Sumps were identified in Buildings #2, #4 (demolished), and #17 and were sampled in conjunction with groundwater sampling events. The results were compared to groundwater PAL although, as noted below, several sumps do not contain groundwater.

The Building #2 sump is in the basement and has a pump with an on/off float that conveys water to a sewer pipe. The water in the sump was sampled twice. Chloroform, benzo(a)pyrene, arsenic, sodium, and Aroclor 1260 were reported at concentrations above PAL. Aroclor 1260 and benzo(a)pyrene were only detected once above PALs. The closest monitoring well (E-9) to this sump had similar chloroform concentrations and no other VOC PAL exceedances consistent with the Building #2 sump. The Building #2 sump is below grade and regularly pumps water, indicating it may be communicating with the shallow fill unit groundwater.

The Building #4 sump is in the floor slab of the demolished Building #4. At the beginning of the RI, vehicle dismantling occurred on the former Building #4 concrete slab. The sump is exposed to weather, and no VOCs were reported above groundwater PALs. Several SVOCs and metals were above PALs. Aroclor 1260 was detected above its PAL. The contents of the sump represent precipitation runoff from the Building #4 floor slab and not groundwater.

There are two sumps inside the vacant, deteriorating Building #17. The sumps are in the bottom floor which is partially below grade. This floor becomes submerged by water after precipitation events resulting in a determination that the liquids in the sumps are suspected to be related to precipitation entering into the building and not groundwater. No VOCs were above the groundwater PALs. No PCBs were detected. 1,4-Dioxane (Sump 2 only) and several metals were above groundwater PALs.

Sewer

The assessment of the sewer system resulted in the collection of water samples at four Lot 1 manholes. Samples from Manholes 17 and 20 were from active sewers where site tenants/owners are discharging to these publicly owned treatment works (POTW) sewers.

Three of the four sewer water samples had no PAL exceedances. Manhole 8 had methylene chloride and TCE above the PALs. A solid sample collected from Manhole 8 contained methylene chloride and toluene concentrations that were above 1 mg/kg. Two SVOCs and several metal concentrations were above 1 mg/kg. The sewer at this location was classified as inactive based on observations of no flow and lack of current users upstream of the location.

Being an inactive sewer at this location and based on results, its contents are considered to be waste, if released into the environment. Based on RI results, other sewer locations are not sources of groundwater or soil impacts reported in the RI.

Lot 57 Sewer/Groundwater

The Lot 57 wall sewer sample contained elevated toluene and acetone concentrations. The acetone concentration was 83,000 micrograms per liter (µg/L). The nearest shallow fill well (MW-118) to the wall sewer sample had acetone concentrations from 51,000 to 71,000 µg/L.

The deep unit well (MW-204) adjacent to MW-118 was non-detect for acetone.



The flow from the pipe increased during sampling indicating that the source may not always be a passive source. In the RIR, water in the pipe and well was to be evaluated in the FS. In March 2020, USEPA directed that the remediation of Lot 57 be conducted under NJDEP via a Licensed Site Remediation Professional (LSRP) outside of the FS. The NJDEP assigned case number via the NJDEP Hotline is 20-04-05-0923-04. The remediation activities will be conducted by the person responsible for remediation (Lot 57 owner/operator). LSRP is to communicate and work with USEPA on Lot 57 remedial action. USEPA through NJDEP is to approve of any work.

Indoor Air

Indoor air and exterior ambient air samples were collected and analyzed from occupied buildings (Buildings #1, #2, #3, #9, #10, #14, and #16) during the heating season (as defined by NJDEP). The samples were analyzed for benzene, ethylbenzene, xylenes, 1,1,2-TCA, carbon tetrachloride, chloroform, isopropylbenzene, naphthalene, TCE, and vinyl chloride.

Benzene concentrations were above its PAL (0.36 microgram per cubic meter [$\mu\text{g}/\text{m}^3$]) in each building's indoor air and also in ambient air. Chloroform was above its PAL in Buildings #2, #10, and #14. Ethylbenzene and TCE concentrations in Building #1 were above PALs. Other parameters were not above a PAL. Xylenes and benzene were detected in ambient air.

The three highest VOC concentrations in ambient air are as follows:

- 0.99J $\mu\text{g}/\text{m}^3$ - m,p-Xylene
- 0.76J $\mu\text{g}/\text{m}^3$ - Benzene
- 0.45J $\mu\text{g}/\text{m}^3$ - o-Xylene

Operations in several buildings (Buildings #9, #10, #14 and #16) sampled use organic solvents in their process or routinely have gasoline/diesel powered vehicles/equipment in the building sampled. Gasoline/diesel equipment was not operating during sampling. As indicated in Section 8.9 of the RIR, indoor air at select unoccupied lots would be addressed in the FS if occupied buildings are constructed on them.

Fate and Transport

VOCs, SVOCs (represented by polycyclic aromatic hydrocarbon [PAH] compounds and petroleum hydrocarbon [PHCs]), metals, PCB aroclors, and tetrachlorodibenzoparadioxin (TCDD) have been detected in soil and groundwater.

Biodegradation of some compounds like VOCs is rapid. SVOCs and metals at the Site are less susceptible to degradation and, therefore, are relatively persistent in the environment. The RI did not include a monitored natural attenuation (MNA) study at the Site. In addition to biodegradation, the chemical solubility, volatility, and its tendency to absorb to soil, all affect the fate and movement through soil and groundwater.

Potential transport interactions at the Site include the following:

- Overland stormwater,
- UST contents to groundwater,
- Soil to groundwater,
- One sewer manhole to soil/groundwater,
- Groundwater - surface water potential interaction,
- River - site soil potential interaction,
- Soil gas to indoor air,
- Soil to airborne dust, and
- One sewer pipe (P57-1).



Additional details on fate and transport are provided in Section 5 of the RIR.

Risk Assessment

The BHHRA and SLERA for the Site were prepared by Ramboll and provide the full details on these assessments. Both risk assessments were performed without consideration of existing or planned engineering and institutional controls.

The significance of potential exposures to concentrations of COPCs in soil, indoor air, and groundwater was evaluated based on conservative estimates of reasonable maximum exposure (RME) under current and potential future land use at the Site. The significance of potential exposures was determined by comparing estimates of cumulative cancer risks to the National Contingency Plan (NCP) risk range (10^{-4} to 10^{-6}) and non-cancer hazard indices (HIs) to the protection goal of 1.

Under current land use, the potentially exposed populations at and around the Site are conservatively assumed to include outdoor workers (only at occupied Lots 1, 57, 59, 60, 62, 69, and 70), indoor workers (only at occupied lots), utility workers, construction workers (only at lots slated for redevelopment in the near future, which are Lots 57, 58, 61, 63, 64, 68, and 70), trespassers, visitors (only at occupied lots), and off-site workers and residents (via wind transport).

Under future commercial/industrial land use, the potentially exposed populations at and around the Site are conservatively assumed to be the same as for current land use except that each of the 15 properties are evaluated for all receptors (i.e., receptors may be present at redeveloped lots). The potentially exposed populations at and around the Site are conservatively assumed to include outdoor workers, indoor workers, utility workers, construction workers, trespassers, visitors, off-site workers (via wind transport and future shallow groundwater migration), and off-site residents (via wind transport).

As required by USEPA, the BHHRA includes a hypothetical residential scenario which assumes the Site will have medium-density residential units. Additionally, hypothetical potable shallow and deep groundwater use is evaluated for on- and off-site workers, visitors and residents to facilitate development of appropriate institutional controls for the Site.

The COPC, lot, and medium under current and future commercial/industrial land use that have cumulative cancer risks greater than the NCP risk range (10^{-4} to 10^{-6}), or non-cancer HIs greater than the protection goal of 1, or for lead, exceedance of 800 mg/kg (USEPA Region 2 non-residential screening level) or greater than a 5 percent probability that estimated blood lead levels are above 5 microgram per deciliter ($\mu\text{g/dL}$) are as follows:

Lot	Receptor	COPC	Medium
Current Use:			
1	Visitors	Lead	Soil
61	Construction worker	Lead	Soil
62	Visitors	Lead	Soil
63	Trespasser, construction worker	Lead	Soil
64	Construction worker, trespasser (B-75)	Lead	Soil
68	Construction worker	Lead	Soil
70	Construction worker, trespasser, outdoor worker, visitors	Lead	Soil

Lot	Receptor	COPC	Medium
Future Use:			
1	Visitor – child	Lead	Soil
58	Indoor worker (vapor intrusion)	TCE, xylenes	Soil
61	Construction worker	Lead	Soil
62	Indoor worker (vapor intrusion)	Naphthalene	Soil
	Construction worker, Visitor - child	Lead	Soil
63	Outdoor worker, indoor worker (dust), trespasser, construction worker, visitor - child	Lead	Soil
	Visitor - child	Copper	Soil
64	Construction worker, visitor - child, outdoor workers and trespassers (B-75)	Lead	Soil
65	Construction worker, visitor - child	Lead	Soil
68	Construction worker, visitor - child	Lead	Soil
	Indoor worker (vapor intrusion)	TCE	Soil
70	Outdoor worker, trespasser, construction worker, visitor - child	Lead	Soil

Note: All COPC or chemicals of potential ecological concern (COPEC) that have risks/hazards in excess of applicable criteria/standards are carried through to the FS where it is determined which ones will be the focus of the remedial alternatives presented. Compounds identified in the ROD are considered to be chemicals of concern (COCs).

A hot spot analysis identified three locations from Lot 64 (B-75 at 1 to 3 feet bgs of 8,690 mg/kg, B-74 at 3 to 4 feet bgs of 3,080 mg/kg, and B-70 at 5 to 7 feet bgs of 3,020 mg/kg, which are adjacent to Lot 63) that could affect the conclusions of the risk assessment for future outdoor worker and trespasser exposure to lead in soil from the subsurface that is brought to the surface during site redevelopment. Although prolonged exposure to these locations in isolation is not anticipated, they will be retained for further evaluation in the FS.

Cumulative cancer risks are greater than the NCP risk range (10^{-4} to 10^{-6}), non-cancer HIs are greater than the protection goal of 1, and estimated blood lead levels exceed acceptable thresholds for hypothetical residential use. Risks associated with potable use of shallow and deep groundwater, if to occur in the future, are also unacceptable. Although groundwater is designated as Class IIA, potable use of shallow groundwater at the Site is unlikely since the Site and surrounding area are served by the City of Newark's potable water system. The site-specific conductivity readings of the shallow groundwater indicate possible brackish conditions, and Lots 67, 68, 69 and 70 currently have restrictions in place to prevent groundwater use.

The findings of the SLERA identified the potential for unacceptable ecological risk; however, no additional ecological investigation is needed, provided that the proposed remedial alternatives will address the COPECs associated with hazard quotients (HQs) greater than 1 in surface soil, and that remediation goals that are protective of ecological receptors are used. Additional response actions will be evaluated for Lot 67 and Lot 69, where the SLERA identified unacceptable ecological risk with HQs greater than 1 in surface soil.

To summarize the risk assessments, response actions are being evaluated for unacceptable human health risks, which will address copper (Lot 63), lead (Lots 1, 61, 62, 63, 64, 65, 68, and 70), VOCs (Lots 58 and 68), and naphthalene (Lot 62) contamination, and the response action for these contaminants and areas will consider the potential ecological risk identified in the SLERA for Lots 67 and Lot 69.



Remedial Action Objectives

Medium-specific RAOs have been developed to mitigate potential site-related health risks, and corresponding General Response Actions (GRAs) have been identified that could potentially satisfy the RAOs. The medium-specific RAOs focus on the specific areas and regulated substances to which exceedances of USEPA's target risk criteria are attributed. RAOs were developed for wastes, soil, groundwater, soil gas and sewer water as follows:

Wastes

Secure or remove wastes to the extent practicable to prevent human and ecological exposures.

Prevent uncontrolled movement of wastes (i.e., spills and free-phase liquid) to environmental media.

Minimize or eliminate human and ecological exposure to waste materials.

Soil

Remove or minimize COPC concentrations and eliminate human exposure pathways to COPCs in soil and fill material.

Remove or minimize COPEC concentrations and eliminate or minimize ecological exposure pathways to COPECs in surface soil and surface fill material.

Prevent or minimize off-site transport of soil containing COPCs to minimize the potential for interaction between the Site and the Passaic River.

Prevent or minimize potential for leaching of COPCs to groundwater and surface water from soil and fill.

Groundwater

Minimize contaminant concentrations and restore groundwater quality.

Prevent exposure to COPCs in groundwater.

Prevent or minimize migration of groundwater containing COPCs.

Prevent or minimize discharge of groundwater containing COPCs to surface water to minimize the potential for interaction between the Site and the Passaic River.

Soil Gas

Minimize contaminant levels in sources of COPCs in soil gas that may migrate to indoor air.

Sewer Water

Prevent exposure to COPCs in sewer water and solids associated with a release from the inactive sewer system.

Minimize concentrations of COPCs in sewer water (inactive system).

Prevent or minimize discharge of sewer water COPCs to surface water to minimize the potential for interaction between the Site and the Passaic River.

Preliminary Remediation Goals

PRGs are chemical-specific, quantitative goals for each medium and/or exposure route that are intended to be protective of human health and the environment and meet RAOs. PRGs were developed based on ARARs and risk-based levels (human health and ecological), with consideration of current and reasonably anticipated future use, background concentrations, analytical detection limits, guidance values, and other available information to aid in defining the extent of contaminated media and enable remedial action cost estimation.

Preliminary Remediation Goals for Wastes

Wastes will be remediated via removal from the Site.

Preliminary Remediation Goals for Soil

COPCs or COPECs that have unacceptable risks/hazards and/or exceed ARARs as described above are identified as COCs that are carried through to the FS and will be the focus of the remedial alternatives presented. PRGs for COCs associated with unacceptable risks listed in the RIR are summarized below:

- Lead – 800 mg/kg
- Copper – 526 mg/kg
- TCE – 0.02 mg/kg
- Xylenes (total) – 6.5 mg/kg
- Naphthalene – 0.26 mg/kg

In addition, PCBs, lead and benzene were identified as soil COPCs because RI results indicated levels of these COPCs exceed ARARs (NJDEP Non-Residential Direct Contact Soil Remediation Standards [NRDCSRS]). The PRGs for these COCs are the ARARs (NRDCSRS):

- PCB - 1 mg/kg
- Lead - 800 mg/kg
- Benzene - 5 mg/kg

Lead, copper, TCE, xylenes, naphthalene, PCB and benzene are soil COC to be addressed by remedial alternatives in the FS.

Preliminary Remediation Goals for Groundwater

Groundwater in some wells contains contamination above ARARs. Site-related COPCs that exceed ARARs are identified as COCs that are carried through to the FS and will be the focus of the remedial alternatives. The groundwater COCs and the respective PRGs are as follows:

VOCs

- | | |
|-------------------------------|------------|
| • Acetone | 6,000 µg/L |
| • Benzene | 1 µg/L |
| • Ethylbenzene | 700 µg/L |
| • Tetrachloroethane, 1,1,2,2- | 1 µg/L |
| • Tetrachloroethylene | 1 µg/L |
| • Toluene | 600 µg/L |

- Trichloroethane, 1,1,2- 3 µg/L
- Trichloroethylene 1 µg/L
- Xylene, m,p 1,000 µg/L
- Xylene, o- 1,000 µg/L

SVOCs

- Cresol, p- 50 µg/L
- Benzo[a]pyrene 0.1 µg/L
- Dioxane, 1,4- 0.4 µg/L

Metals

- Lead 5 µg/L

Preliminary Remediation Goals for Soil Gas

Soil gas concentrations attributed to COCs in soil/fill present unacceptable human health risks to future indoor workers. PRGs for soil gas are the same as listed for TCE, total xylenes, and naphthalene for soil.

Preliminary Remediation Goals for Sewer Water

The remediation goal for sewer water at an inactive portion of the northern sewer line (Manhole 8) on Lot 1 is removal followed by reduction of TMV. Remedial alternatives will address the contents of Manhole 8 (water and solids) and the accessible pipe with the wastes.

Alternatives

Commented [SM1]: Common responses? FYRs? ICs? ECs?

Waste Alternative 1 — No Action

Under this alternative, no action would be taken. This alternative is retained for comparison with the other alternatives as required by the NCP. Under no action, remaining source materials at the Site would be left in place, and no means of securing the materials to prevent future release to the environment would be implemented. The no-action alternative has no capital costs over the 30-year project life, and would incur only costs related to the five-year reviews required by the NCP, estimated to have a net present value of \$98,000.

Waste Alternative 2 — Removal and Off-Site Disposal

This alternative consists of the transfer of wastes into appropriate containers or transport vehicles for off-site recycling or disposal, along with proper closure of USTs by removal. The means for disposal of the various wastes would be determined during the remedial design. Upon removal of contents, the USTs would be removed in accordance with New Jersey tank closure regulations. The present worth cost of this alternative is \$712,000 for 30 years.

Soil/Fill Alternative 1 – No Action

Under this alternative, no action would be taken. This alternative is retained for comparison with the other alternatives as required by the NCP. Under no action, new deed restrictions and other institutional controls would not be implemented, and future use of the subject areas would be unrestricted except that existing NJDEP-approved institutional and engineering controls would remain intact.

The No Action alternative has no capital costs over the 30-year project life, and five-year review costs are included in the Waste Alternative 1 cost estimates.

Soil/Fill Alternative 2 – Institutional Controls and Limited Action

Commented [SM2]: What is the action? The alt is all ICs and ECs.

For this alternative, deed notices would be recorded on all 15 lots. Existing deed notices would be revised to reflect RI results and existing engineering controls for applicable lots. Fencing would be maintained and enhanced as appropriate in order to limit unauthorized access to the area and prohibit future use of the area in a manner which may expose human receptors to unacceptable risk. Deed restrictions establishing requirements for new construction (i.e., vapor barriers and/or passive or active depressurization systems to prevent indoor vapor intrusion) and ensuring future use consistent with the use assumptions of the BHHRA would be developed and implemented. Regular site inspections would be performed to ensure compliance with the deed restrictions. Existing zoning and local ordinances associated with use of the Site would also be reviewed and modified as appropriate to ensure compliance with the objectives of this alternative. No attempt would be made to excavate, cover, and/or treat the affected soil. The present worth cost of this alternative is \$159,000 for 30 years.

Commented [SM3]: Fencing is an engineering control.

Soil/Fill Alternative 3 – Engineering and Institutional Controls

Under Alternative 3, the affected soil on Lots 1, 58, 61, 62, 63, 64, 65, 68, and 70 would be left in place, and would be addressed by engineering controls (cover system) and institutional controls (deed notice), as appropriate, for the associated unacceptable risk. Soils presenting potential unacceptable ecological risks on Lots 67 and 69 would also be addressed by these controls. In addition, the bulkhead along the Passaic River would be reinforced or reconstructed, as appropriate, with new sheet piling or shoreline revetment in order to minimize the potential for interaction between the Site and the river.

For Lots 61, 62, 63, 64, 65, 68, and 70, there is unacceptable risk associated with outdoor workers exposed to concentrations in the top 2 feet of soil, or from subsurface soil moved to the surface during redevelopment, or there is COC ARAR exceedance. Existing deed notices with caps presently exist at the Site. Other lots at the Site have concrete or asphalt surface pavement although not part of a deed notice. During the remedial design, these surfaces would be inspected to determine their suitability to be used as a cover. Some areas of the existing pavement may need repaired.

A single-layer 6-inch asphalt cap is cover under this alternative. However, a soil cover may be appropriate for some lots based on near-term future use.

The existing bulkhead along the riverfront consists of various materials (steel, wood, concrete), and varies in condition from poor/failing to good, with the wood bulkhead sections generally in the worst condition and the steel and concrete sections generally in the best condition. A geotechnical investigation would be required for both bulkhead enhancement process options. For the purposes of this FS, one process option is that wood sections would be replaced with new sheet piling tied into the adjacent steel and concrete sections of the wall. Additionally, steel sheeting would be installed along Lots 67 and 63 where a bulkhead is not currently present. Both bulkhead enhancement options will incorporate active stormwater discharge pipes as appropriate, and existing inactive river wall pipes would be sealed. Approximately 800 feet of bulkhead enhancement would be constructed.

The second process option is shoreline revetment which would require sloping the shoreline back and placement of an impermeable liner and R-6 or larger riprap in those locations where such an approach would be compatible with current land use.

Both bulkhead enhancement options reduce the potential interaction between the Site and the Passaic River. Both options are also compatible with remedial action being designed in the Lower 8.3 miles of the Lower Passaic River, in accordance with the March 2016 Diamond Alkali OU2 ROD. Currently, the OU2 remedial design anticipates bank-to-bank sediment dredging with dredging offsets from any riverbank and placement of a cap over remaining river sediment. The installation of the shoreline revetment option would disturb less river sediment than the sheet pile wall.

This alternative would also include the limited action activities of Soil Alternative 2 to prevent future disturbance of the cover system and maintenance of the bulkhead. Under this alternative, proposed engineering and institutional controls



would be in addition to existing NJDEP-approved controls. The present worth cost of this alternative is \$4,598,000 (sheet pile) or \$3,213,000 (riprap) for 30 years.

Soil/Fill Alternative 4 – Excavation and Off-Site Disposal

Under this alternative, COC-impacted soil is excavated and transported to a permitted off-site facility for subsequent treatment (if needed) and disposal. The excavated areas would be backfilled and finished in a manner consistent with current conditions (i.e., asphalt paving, grass, etc.) or as otherwise appropriate for subsequent site redevelopment plans if available, with appropriate erosion and surface drainage controls implemented. Off-site disposal would occur at an appropriately licensed solid waste or hazardous waste landfill, depending on the results of disposal characterization sampling which would be conducted as part of the remedial design.

For the purposes of the FS, it is assumed that for Lots 1, 58, 61, 62, 63, 64, 65, 68, and 70, select soils above the water table with COC concentrations above the PRGs, including LNAPL-impacted soil, would be excavated and disposed, such that remaining soils above the water table would be in compliance with PRG cleanup goals. Actual volumes of soil to be disposed of will be dependent on the cleanup levels and the results of further delineation during remedial design, and post-excavation sampling. Excavation could extend across lot boundary lines as needed to meet remedial goals. Soils located beneath existing buildings would not be excavated.

Commented [SM4]: Provide an estimate for costing purposes.

As part of this alternative, a cap would be placed on Lots 67 and 69 to address potential ecological exposure in surface soils on those lots.

As the scope of this alternative is based on risks calculated under specific assumed future use of the Site, institutional controls would be implemented, such as deed notice, to ensure that the future use of the Site is consistent with the assumptions of the BHHRA. The present worth cost of this alternative is \$5,744,000 for 30 years.

Soil/Fill Alternative 5 – Hot Spot Excavation and Capping

This alternative combines the excavation and off-site disposal aspects of Soil/Fill Alternative 4 for lead-impacted soils on Lots 63 and 64 with the capping aspects of Soil/Fill Alternative 3 for the remaining affected soils. As with the other alternatives, institutional controls such as deed restrictions would be implemented to ensure that the future use of the Site is consistent with the assumptions of the BHHRA.

For Lots 63 and 64, select hot spot soils identified in the BHHRA with lead concentrations above the PRG and LNAPL-impacted soil would be excavated and disposed off-site. Actual volumes of soil to be excavated will be dependent on the determined cleanup levels and the results of further delineation during remedial design, and post-excavation sampling. Soils located beneath existing buildings would not be excavated.

Because of the extent of soil/fill, some of which has been identified as historic fill, excavation under this alternative does not reduce the extent of capping. The remaining soil containing COCs on Lots 1, 58, 61, 62, 63, 64, 65, 68, and 70 would be capped to address the associated potential unacceptable human health risk. Soils presenting potential unacceptable ecological risks on Lots 67 and 69 would also be capped. Capping under this alternative would be as described in Soil/Fill Alternative 3 for a 6-inch asphalt cap with assessment of existing surface pavement. The present worth cost of this alternative is \$3,056,000 for 30 years.

Soil/Fill Alternative 6 – In-Situ Treatment

Under this alternative, the affected soils would be subject to one or more of several readily implementable and well developed in-situ treatment methods. The specific methods to be implemented for each lot will depend on the nature of the contaminants to be treated and selected in remedial design. Treatability studies and/or pilot studies would occur during remedial design.

Exemption 5, Deliberative



As part of this alternative, an asphalt cap would be placed on Lots 67 and 69 to address potential ecological exposure associated with COCs in surface soils on those lots.

As with other alternatives, institutional controls would be implemented, such as deed restrictions, to ensure that the future use of the Site is consistent with the assumptions of the BHHRA. The present worth cost of this alternative is \$4,179,000 for 30 years.

Groundwater Alternative 1 – No Action

Under this alternative, no action would be taken to reduce the potential for unacceptable exposures of humans to impacted groundwater or minimize further aquifer degradation. Existing NJDEP-approved institutional and engineering controls would remain intact. This alternative is retained for comparison with the other alternatives as required by the NCP. The No Action alternative costs are included in the Waste Alternative 1 estimates.

Groundwater Alternative 2 – Institutional Controls

Groundwater Alternative 2 includes maintaining the existing Classification Exception Area (CEAs) and Well Restriction Area (WRAs) which have already been designated for portions of the Site and designating additional CEAs and WRAs for the remainder of the Site. The CEAs provide notice that groundwater in the area does not meet designated use requirements, and the WRAs prohibit the installation and use of wells for potable and other uses within the designated area. Periodic monitoring and reporting to demonstrate compliance with the restrictions would be required. The present worth cost of this alternative is \$2,211,000 for 30 years.

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Groundwater Alternative 3 – Institutional Controls and Monitored Natural Attenuation

This alternative combines the CEA and WRA components of Groundwater Alternative 2 with the natural degradation of COCs in the aquifer by natural biological, chemical, and/or physical processes. An assessment of the potential occurrence of MNA processes was not conducted as part of the RI. As indicated by RI results, in general groundwater quality improved between RI Phases 1 and 2. For chlorinated VOCs, concentrations for PCE and its degradation products have decreased substantially, providing evidence of the potential occurrence of natural attenuation processes. Additionally, dissolved oxygen and redox potential field measurements, the presence of abundant iron and manganese, and decreasing concentrations downgradient of the Lot 64 UST area are suggestive of natural anaerobic biodegradation of BTEX compounds.

Groundwater monitoring focused on MNA processes during the remedial design is in this alternative. Ongoing groundwater monitoring would be performed to confirm that these natural processes are occurring, and that this alternative continues to be protective of human health and the environment. As part of the monitoring program, the installation of additional groundwater monitoring wells may be appropriate. If NAPLs are observed in Site groundwater, then MNA would not apply to NAPL within that area. The present worth cost of this alternative is \$2,276,000 for 30 years.

Exemption 5, Deliberative

Groundwater Alternative 4 – Institutional Controls and Containment

This alternative combines the CEA and WRA components of Groundwater Alternative 2 with engineering controls to isolate contaminated groundwater from the environment and reduce potential hydraulic communication with off-site surface water. Sheet piling or slurry walls constructed to the top of an underlying confining layer, most likely the glacial lake bottom silt deposits starting between 20 and 40 feet below grade, would be used to reduce lateral migration. Additionally, unpaved portions of the Site would be covered with a single-layer impermeable cap, and existing paved areas would remain intact to reduce infiltration of precipitation and flood water from causing a buildup of water within the containment area, which could require pumping and ex-situ treatment were it to occur. Appropriate deed restrictions would be implemented to prevent disturbance of the cap and vertical barrier. This alternative would be implemented

for the entire Site. This alternative does not eliminate the need for institutional controls or reduce the expected duration of the controls. The present worth cost of this alternative is \$13,937,000 for 30 years.

Groundwater Alternative 5 – Institutional Controls and In-Situ Remediation

Alternative 5 includes the CEA and WRA components described for Groundwater Alternative 2. Additionally, impacted groundwater would be subject to in-situ remediation. The objective of this alternative would be to reduce COC concentrations in groundwater, eventually restoring groundwater quality.

This alternative includes "hot-spot" treatment of the UST excavation water and areas if measurable NAPLs in groundwater are observed combined with MNA (Groundwater Alternative 3).

For organic COCs, the most likely in-situ treatment methods include in-situ chemical treatment, biosparging, and air sparging. Pilot- and bench-scale testing would be required as part of the remedial design to determine the most appropriate treatment approach and reagents for site groundwater. However, tidal influences and brackish water quality effects on in-situ treatment effectiveness need to be assessed.

Metal COCs in groundwater are not suitable for in-situ remediation because of their ubiquitous presence in historic fill. As described in the RIR, fill material is present in surface soils and subsurface throughout the Site. This material is considered "historic fill" as it complies with the NJDEP definition of historic fill. The RI did not include a study to allocate metals in groundwater to historic fill or historical and /or current operations at the Site. Metal COCs would be addressed via institutional controls listed in Groundwater Alternative 2. This alternative does not eliminate the need for institutional controls or reduce their expected duration. The present worth cost of this alternative is \$3,506,000 for 30 years.

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Sewer Water Alternative 1 – No Action

Under this alternative, no action would be taken. This alternative is retained for comparison with the other alternatives as required by the NCP. Under no action, the water and solids in the designated section of sewer and associated line would be left in place, and no means of securing the materials to prevent future release to the environment would be implemented. The No Action alternative has no capital costs over the 30-year project life, and five-year review costs are included in the Waste alternative estimates. Thus, this alternative has no present value.

Sewer Water Alternative 2 – Removal and Off-Site Disposal

This alternative consists of the transfer of the water and solids into appropriate containers or transport vehicles for off-site treatment and/or disposal. Liquid materials would be pumped into drums and transferred to an appropriate facility for treatment and disposal. Remaining solids in the manhole would be vacuumed into a drum and disposed of in an appropriate solid waste landfill. Upon removal of the contents, the interior of the manhole and associated line would be closed in place by plugging/filling. The present worth cost of this alternative is \$26,300 for 30 years.

Soil Gas Alternative 1 – No Action

Under this alternative, no action would be taken. This alternative is retained for comparison with the other alternatives as required by the NCP. Under no action, no measures would be taken to protect future indoor workers from exposure to organic soil vapors. Existing NJDEP-approved institutional and engineering controls would remain intact. The No Action alternative has no capital costs over the 30-year project life, and five-year review costs are included in the Waste alternative estimates. Thus, this alternative has no present value.

Soil Gas Alternative 2 – Institutional and Engineering Controls

This alternative consists of establishing or enhancing deed notices and/or CEAs on the affected lots to provide certain restrictions upon the use of the property. Such restrictions would require that prior to existing buildings being occupied in the future, a building-specific assessment of sub-slab soil gas and/or indoor air quality would be performed, and if needed, some means of protecting the future occupants of such existing buildings from vapor intrusion risks would be implemented. Additional restrictions would require that future new construction include a vapor barrier or other appropriate means of sealing the ground surface underneath the new building slab. The present worth cost of this alternative is \$169,000 for 30 years.

Soil Gas Alternative 3 – Sub-Slab Depressurization System

This alternative consists of establishing or enhancing deed notices and/or CEAs on the affected lots to provide certain restrictions upon the use of the property, as described for Soil Gas Alternative 2. In addition, an active Subsurface Depressurization System (SSDS) would be installed for each of the existing buildings on the affected lots within the limits of potential vapor intrusion, as determined during the remedial design. Ongoing SSDS operational monitoring and indoor air monitoring would be required to ensure the future indoor workers are protected. The present worth cost of this alternative is \$295,000 for 30 years.

Comparative Analysis of Alternatives

Commented [SM9]: Are the 9 criteria even presented and defined?

The comparative analysis evaluates how each of the remedial alternatives achieves the evaluation criteria relative to one another. To compare the alternatives, ratings of poor, fair, good, or excellent were assigned to each of the evaluation criteria used in the analysis of the alternatives.

Waste

In terms of overall protectiveness, compliance with ARARs, long-term effectiveness, and reduction of TMV, Alternative 2 (removal and off-site disposal) is rated better than Alternative 1 (no action), which rates poorly in each of those categories. In terms of short-term effectiveness, implementability, and cost, Alternative 1 rates better as no action is taken.

Soil

Compliance with chemical-specific ARARs for some COCs may not be feasible due to the nature of the soil/fill. Up to 15 feet of NJDEP defined historic fill exists beneath the Site. The sources of fill are unknown. As fill placement occurred over a more than 30-year period, the sources and thus physical and chemical properties could be different. The fill material consists predominantly of sands, silts, and gravel along with man-made materials such as brick, pieces of concrete block, wood, glass, and cinders. The fraction of each material in the fill varies across the Site. When a COC is related to natural conditions or historic fill, it is ubiquitous in the soil/fill, like background concentrations, likely resulting in non-compliance with chemical-specific ARARs regardless of alternative. In terms of protectiveness, compliance with ARARs, and long-term effectiveness, Alternatives 3 (cap and bulkhead enhancement), 5 (hot spot excavation/disposal with capping) and 6 (in-situ remediation) rate better compared to the remaining alternatives, with Alternative 6 also rating better for reduction of TMV by treatment. However, Alternative 6 does not eliminate capping needed to meet the chemical-specific ARARs (PRGs).

In terms of overall protectiveness, compliance with ARARs, and long-term effectiveness, Alternatives 3 (cap and bulkhead enhancement), 5 (hot spot excavation/disposal with capping), and 6 (in-situ remediation) rated better compared to the remaining alternatives, with Alternative 6 also rating better for reduction of TMV by treatment. However, Alternative 6 does not eliminate capping or clean surface cover to meet the chemical-specific ARARs (PRGs).

Alternative 1 (no action) would not meet the chemical-specific ARARs since no action would be taken. Alternative 2 (institutional controls and limited action) would not meet chemical-specific ARARs other than institutional controls. Alternatives 3, 5, and 6 would comply with the chemical-specific ARARs and would meet the PRGs since contaminated soil would be treated, contained or removed from the site. Chemical-specific ARARs for Alternative 4 (excavation and off-site disposal) would be met for shallow soil via removal of soil containing COC but may not meet ARAR for the deeper contaminated soil. Location- and action-specific ARARs are met by Alternatives 3 through 6.

Alternative 3 rates the best for minimizing human and ecological exposure to soil/fill and preventing off-site transport of soil containing COCs. Not including the No Action alternative, Alternative 2 (limited action) rates best for short-term effectiveness, implementability, and cost. Alternatives 3 through 6 provide long-term effectiveness with Alternatives 4 through 6 providing better permanence due to excavation/disposal or in-situ treatment.

Alternatives 2 through 6 have similar long-term operation and maintenance (O&M) obligations through institutional controls. Other than No Action alternative, none of the soil/fill alternatives reduce these obligations to less than 30 years assumed in the FS process.

Not including the No Action alternative, Alternative 2 rates best for short-term effectiveness, implementability, and cost.

Groundwater

Groundwater Alternatives 3 through 5 are similar in terms of overall protectiveness, compliance with ARARs, long-term effectiveness, and reduction of TMV, largely due to the challenge of addressing metals in groundwater within soil/fill. For reduction of TMV, Alternative 5 (in-situ) rates better in the short term because potential source areas are treated. However, tidal influences on in-situ treatment may negatively impact this rating.

Alternative 1 would not meet the chemical-specific ARARs since no action would be taken. Location- and action-specific ARARs are met by Alternatives 3 through 5.

In terms of the implementability and cost, Alternatives 2 (institutional controls) and 3 (MNA) rate the best, while Alternative 4 (containment) rates the worst. Alternative 5 (in-situ) rates the best for short-term effectiveness for some COCs. Alternatives 2 through 5 have similar long-term O&M obligations through institutional controls. None of these four groundwater alternatives eliminate O&M obligations to less than 30 years assumed in the FS process. Under Alternatives 3 through 5 (pending MNA suitability determination), O&M obligations related to groundwater organic COCs would diminish within 30 years.

Soil Gas

Alternatives 2 (institutional and engineering controls) and 3 (SSDS) rate similarly excellent in terms of overall protectiveness, compliance with ARARs, and long-term effectiveness, with Alternative 2 rating slightly better than 3 in the remaining criteria due to the higher cost associated with Alternative 3.

Sewer Water

In terms of overall protectiveness, compliance with ARARs, long-term effectiveness, and reduction of TMV, Alternative 2 (removal and off-site disposal) is rated better than Alternative 1 (no action), which rates poorly in each of those categories. In terms of short-term effectiveness, implementability, and cost, Alternative 1 rates better as no action is taken.

1. INTRODUCTION

This Draft Feasibility Study Report (FS Report) describes the performance of the feasibility study (FS) at the Riverside Industrial Park Superfund Site (the Site) located in Newark, Essex County, New Jersey (Figure 1-1). The FS was conducted in accordance with the Administrative Settlement Agreement and Order on Consent (ACO) (Comprehensive Environmental Response, Compensation, and Liability Act of 1980 [CERCLA] Docket No. 02-2014-2011) and prepared on behalf of PPG Industries (PPG). The FS conducted under this Settlement Agreement is subject to approval by U.S. Environmental Protection Agency (USEPA).

The FS Report represents the third and final deliverable in the FS process and builds upon the two previous FS deliverables for the Site. The Remedial Investigation Report (RIR) (Woodard & Curran, Inc. [Woodard & Curran], 2020) along with the risk assessments provide data collected in the remedial investigation (RI) for the development of remedial alternatives in the FS.

The initial FS deliverable is the Identification of Candidate Technologies (ICT) Memorandum (Woodard & Curran, Inc. [Woodard & Curran, 2019a). This ICT Memorandum constitutes Task 5 of the Statement of Work contained in the ACO. The ICT Memorandum is an initial analysis of potential candidate remedial technologies that were considered later in the FS process as potential components of remedial alternatives for the Site. It includes an initial evaluation of available information on the performance, relative costs, applicability, effectiveness and implementability of the candidate technologies.

The ICT Memorandum was prepared prior to the completion of RI data collection and preparation of the Baseline Human Health Risk Assessment (BHHRA) (Ramboll US Corporation [Ramboll], 2020a) and Screening Level Ecological Risk Assessment (SLERA) (Ramboll, 2020b). The ICT Memorandum was submitted in September 2018 shortly after RI Phase 1 was completed. Information on site conditions gathered during Phase 1 provided the basis for the ICT Memorandum. The ICT Memorandum was revised based upon USEPA comments (October 31, 2018 and April 3, 2019) and discussions between PPG and USEPA. The June 12, 2019 ICT Memorandum was approved by USEPA on July 17, 2019.

The Development and Screening of Remedial Alternatives Technical (DASRAT) Memorandum (Woodard & Curran, 2019b), the second FS deliverable, was also prepared and submitted to USEPA prior to the completion of the RI including the risk assessments. The DASRAT Memorandum further refined the candidate technologies from the ICT Memorandum using site characterization information and USEPA's comments on the ICT Memorandum. The DASRAT Memorandum was submitted to USEPA on August 28, 2019. USEPA provided comments in November and December 2019 on the DASRAT Memorandum and responses were submitted to USEPA. USEPA approved the DASRAT Memorandum on February 27, 2020.

The FS Report builds upon the information presented in the DASRAT Memorandum, incorporates updates based on additional information and changes in site conditions since the preparation of the DASRAT Memorandum, and presents a focused evaluation and comparative analysis of remedial alternatives.

1.1 Purpose of Report

This FS Report develops and examines remedial action alternatives, and presents a remediation strategy to address risk and hazards that exceed applicable risk management criteria or standards and are attributable to site-related constituents in environmental media at the Site. Remedial action alternative development and screening considered:

- Site characterization results, including the findings of the human health and ecological risk assessments, as presented in the Remedial Investigation Report (RIR) (Woodard & Curran, 2020);
- Federal and State regulations that are applicable or relevant and appropriate requirements (ARARs);



- Preliminary remediation goals (PRGs)/remedial action objectives (RAOs); and
- Nature and extent of impact at the Site.

This FS Report further evaluates, refines, and analyses the remedial alternatives presented in the DASRAT Memorandum.

In accordance with USEPA protocols, this FS Report provides information for decision-makers to compare alternatives and develop a Proposed Plan identifying the agency's preferred alternative and the rationale for its preference. After consideration of public comment, USEPA will issue a Record of Decision (ROD) setting forth the selected remedy.

1.2 Organization

The remainder of the FS Report is organized as follows:

- Section 2, Background, provides an overview of the physical and ecological setting of the Site, chronicles the site's ownership and operational history, and summarizes the results of activities conducted in support of the RI/FS.
- Section 3, Objectives and Requirements of Site Remediation, provides an overview of remediation requirements based on RI results, and related site-specific PRGs/RAOs, ARARs, and General Response Actions (GRAs); and identifies areas and volumes to be remediated.
- Section 4, Identification and Screening of Technologies and Process Options, identifies and screens process options based on effectiveness, implementability, and relative cost; and provides a general description of selected process options considered for remedial action alternative development.
- Section 5, Development and Screening of Alternatives, presents remedial action alternatives that have been developed from the retained process options.
- Section 6, Detailed Analysis of Alternatives, presents an analysis and comparison of remedial action alternatives identified in Section 5 based on seven evaluation criteria. The remaining two criteria, State acceptance and community acceptance, will be evaluated in the ROD.
- Section 7, References, provides references used in the preparation of this FS Report.

Tables, figures, appendices, and attachments support the text and are referenced where appropriate.

2. BACKGROUND

The following information is from the RIR (Woodard & Curran, 2020) and provides a site description, an overview of the site history, and a summary of previous environmental investigations and removals performed at the Site on behalf of responsible parties through the New Jersey Department of Environmental Protection (NJDEP) Site Remediation Program (SRP) or via independent actions performed by USEPA. The results of the 2017-2019 USEPA CERCLA RI are also summarized in this section.

2.1 Site Description

The Site is a 7.6-acre active industrial site, previously owned by Patton Paint Company until 1971, and located in Newark, Essex County, New Jersey (Figure 1-1). After 1971, the Site was subdivided into 15 parcels/lots, and is identified as the Riverside Industrial Park (RIP). The lots in the northern portion of the Site have Riverside Avenue addresses (Lots 1, 57, 58, 59, 60, 69, and 70), while the lots in the southern portion of the Site have McCarter Highway addresses (Lots 61, 62, 63, 64, 65, 66, 67, and 68). Both Riverside Avenue and McCarter Highway border the Site to the west along with a segment of railroad track adjacent to McCarter Highway (Figure 2-1). Vehicle access is from Riverside Avenue. Much of the surface area of the Site is covered by buildings or pavement. The Passaic River and tidal mudflat border the Site on the east side. A steel, concrete, or wooden bulkhead provides a retaining wall along most of the Site adjacent to the Passaic River; however, the bulkhead has fallen into disrepair in some locations and is collapsed in several sections. Recent site observations indicate a combined sewer outfall pipe under the area of Lot 63 has collapsed, causing subsidence and a collapse of a section of the bulkhead.

There are 14 buildings at the Site with five of the buildings being vacant (Buildings #6, #7, #12, #15, and #17). At the time of the FS, Buildings #1, #2, #3, #9, #10, #13, #14, and #16 had ongoing business operations, and a small garage building (Building #19) was used for storage by the occupant of Building #13. Portions of Lot 64 and former Building #4 had vehicle dismantling activities during some of the FS activities. Surface waste piles on the south portion of the Site and asbestos-containing materials within Building #7 were removed by USEPA during the RI but are not part of the FS.

2.2 Site History

An 1873 map from Atlas of the City of Newark indicates that most of the Site was reclaimed from the Passaic River with imported fill. An 1892 Certified Sanborn Map suggests that some filling occurred in the late 1800s; however, the major filling events at the Site occurred from 1892 to 1909. The origin of fill material at the Site is unknown. Boating docks shown on the north and central portions of the Site in 1892 suggest some placement of fill and reclamation of land from the Passaic River occurred. Most of Lots 57, 61, 62, 63, 64, 66, 67, 68, and 70 were within the footprint of the Passaic River with the Triton Boat Club operating a dock area on the north side of Lot 60. By 1909, most of the lots had been created via filling and land development and included Patton Paint Company structures, a hotel, and a boat club. Portions of Lots 57 and 70 remained part of the Passaic River in 1909 but were created by placement of fill prior to 1931.

Detailed descriptions of the site's ownership history, operational history, historical activities, documented releases, and previous site investigations are provided in RIR Sections 1.3 and 1.4. Highlights from those descriptions are provided below.

- PPG housed paint and varnish manufacturing operations from approximately 1902 to 1971. PPG's operations involved current Lot 1 and Lots 57 through 70.
- Frey Industries, Inc. (Frey) occupied Lots 1, 61, 62, 63, and 64 from 1981 to 2007 when operations ceased. Frey warehoused, packaged, repackaged, and distributed client-owned chemicals. Jobar operated on a portion of Frey's leased property between 1979 and 1982 before its assets were acquired by Frey in 1983.

- Baron Blakeslee, Inc. (BBI) was a sub-tenant of Frey since the early 1980s. BBI occupied Lot 61 for product distribution, warehousing a variety of chemical products, and analysis of various chemical blends and waste samples. They also reportedly used Building #7 (Lot 63) as a laboratory, Lot 62 for drum storage, and Lot 68 as a common truck and tanker parking area. Purex (BBI's parent company) was acquired by Allied Signal. After a series of mergers and acquisitions, BBI became part of Honeywell International, Inc. (Honeywell) in 1999. The City of Newark currently owns Lots 58, 61, 63, 64, and 68.
- Universal International Industries was identified as conducting various manufacturing operations on Lots 1, 63, and 64. No specific information was located regarding its manufacturing activities.
- Samax Enterprises (Samax) occupied Lot 1 from 1999 to 2011 when operations ceased. Samax stored various raw materials on-site and manufactured various chemicals under the brand name Rock Miracle. An industrial company 29 Riverside, LLC currently occupies Lot 1. (The property is currently owned by Hatzlucha on Riverside, LLC.)
- HABA International, Inc. (HABA) occupied Lot 57 from at least 1982 until 1988. Davion Inc. (Davion), successor to HABA, currently operates on Lot 57. (The property is owned by Plagro Realty, Inc.) HABA and Davion manufactured nail polish remover and related products. Acupak, Inc. was a sub-tenant of HABA on Lot 57 from at least 1987 to 1988 and conducted packaging for HABA.
- Roloc Film Processing (Roloc) occupied Lot 60 from 1985 until 2008 when operations ceased and manufactured foils.
- Gilbert Tire Corporation occupied Lot 60 since at least 2015 (following Roloc's occupation) and is the current occupant. (The property is owned by Shefah in Newark, LLC.) There is no manufacturing equipment. Used tires and wheel rims are stored until transferred off property.
- Chemical Compounds, Inc. (CCI) is the listed owner of Celcor Associates, LLC and occupied Lots 62, 66, and 67 from at least the early 1990s and are the current owners. These companies manufactured hair dyes and other personal hygiene products. Beginning in 2015, Teluca began operating on Lot 62. Teluca packages and distributes hair dyes, hair color, and related ingredients to hair color marketers. The facility includes a laboratory for completing hair dye research, offices, and warehousing.
- Gloss Tex Industries, Inc. (Gloss Tex) occupied Lot 69 from 1979 to at least 1989 when operations ceased. Gloss Tex manufactured bulk nail enamel, lacquer, and related cosmetic products. Gloss Tex leased the property from Industrial Development Associates/Corporation (IDA), who currently owns Lot 65.
- Ardmore, Inc. occupied Lots 59 and 69 (following Gloss Tex's occupation) since 1982 and is the current occupant. (The properties are owned by Sharpmore Holdings, Inc. and Albert Sharphouse.) Ardmore, Inc. manufactures soaps and detergents on Lot 59 and stores empty drums on Lot 69.
- Monaco RR Construction Company stored railroad rails, cross ties, and spikes on Lot 70. Following their operation, Federal Refining Company (Federal) occupied Lot 70 from 1985 to 2007 when operations ceased. Federal was a scrap metal recycler, specializing in recovery of precious metals. The current tenant is Midwest Construction Company. Material and equipment used by the company are stored and maintained at the property. (The property is owned by the Estate of Carole Graifman.)

Since 1971, at least 12 documented spills and releases have occurred at the Site, and the Site is subject to at least seven New Jersey Industrial Site Recovery Act (ISRA) remediation cases under NJDEP environmental regulations. Prior to 1971, a vapor cloud released in 1969 from one of the resin reactors in the former PPG Resin Plant (Building #17) ignited, causing a fire/explosion. No discharges to the sewer system or the Passaic River are known to have occurred during this incident. Resin material burned and several process tanks failed during the fire, thus releasing their contents, as discussed in RIR Section 7.2.

Numerous environmental investigations and NJDEP-led remedial actions have been completed on the Site prior to initiating the USEPA CERCLA RI in 2017. The previous areas of concern (AOCs) identified on individual lots were described in the April 2015 Site Characterization Summary Report (SCSR) (Woodard & Curran, 2015). The previous AOCs were investigated during implementation of the NJDEP-led RIs. References to “exceedances” in this section pertain to the specific standards and criteria available at the time of previous investigations and remedial actions which may not be equal to the Project Action Limits (PALs) evaluated for the USEPA CERCLA RI or ARARs cited herein.

2.3 Previous Investigations

As summarized in the SCSR and RIR, numerous environmental investigations and NJDEP-led remedial actions have been completed on the Site prior to initiating the USEPA CERCLA RI in 2017. Applicable results were considered in the FS in evaluating remedial action areas. The sections below provide a summary of previous investigations.

2.3.1 Lot 1

Lot 1 (1.229 acres) contains current Buildings #2 and #3 (Figure 2-1) and former Building #4. Building #4 and a portion of Building #3 were demolished in 1982 after a fire. Buildings #2 and #3 are interconnected and have a common basement.



Lot 1 is a New Jersey known contaminated site associated with Acupak Inc. (ISRA Case #88484) and Samax (ISRA Case #E20110199). The Samax case is still active as ISRA Case #E20110199, the only remedial action proposed was for historic fill and included the implementation of engineering and institutional controls to address soil contamination and a historic fill classification exception area (CEA) for groundwater. The historic fill CEA indicates arsenic, iron, lead, manganese, and sodium concentrations above the NJDEP Groundwater Quality Standard (GWQS) are a result of historical fill. Samax is awaiting direction from USEPA on implementation of the remedial actions under New Jersey PI #563216.

As of November 2019, the property has tenants with ongoing commercial activities. Refer to RIR Section 1.4.1 for details and previous investigations.

2.3.2 Lot 57

Building #10 is on Lot 57, which is 0.42-acre (Figure 2-1). The entire surface is paved or under a building. As of November 2019, the property has ongoing industrial activities.



An acetone spill occurred in 1988 which resulted in acetone-impacted soil being removed from Lot 57 by HABA. Although the post-excavation soil results reportedly indicated that no volatile organic compound (VOC) contamination existed, tabulated results or laboratory reports had not been located in NJDEP files. It is assumed that this NJDEP-led remediation is closed.

2.3.3 Lot 58

Buildings #15 and #15A are located on this Newark-owned property which has an area of 0.2523 acre (Figure 2-1). Former Building #23 was removed between 1979 and 1987. As of November 2019, the property is vacant.



As described in the SCSR and RIR, AOCs pertaining to environmental conditions were identified at Lot 58 in 2009 by Newark's consultant (PMK Group, Inc. [PMK]/Birdsall Services Group [Birdsall], 2009).

Following NJDEP regulations, six AOCs were investigated via a surficial geophysical survey, soil borings and sampling, and groundwater sample (temporary well point [TWP]) collection from soil borings. Historical (2009) groundwater samples from TWPs indicated concentrations of metals, VOCs, semivolatile organic compounds (SVOCs), and pesticides above the NJDEP GWQS. These soil and groundwater results were considered in the RIR and FS.

The USEPA inspected tanks in Building #15 after precipitation water was removed from the building to determine if hazardous material was present in the building during a Time Critical CERCLA Removal Action. The tanks were determined to be empty. There were also no visible signs of contamination in the 2 inches of water remaining in the building floor, and sample results received later confirmed that observation. USEPA then determined that there were no hazardous materials present and, therefore, Building #15 posed no threat to human health and the environment (USEPA, 2011). Refer to RIR Section 1.4.3 for previous investigation details.

At the completion of RI field activities (February 2019), the interior aboveground storage tanks (ASTs) and one exterior AST are still present. The small security building at the site entrance has been damaged by fire. Surface debris piles are present on the lot. Portions of the property are used for parking by employees from other lots.

2.3.4 Lot 59

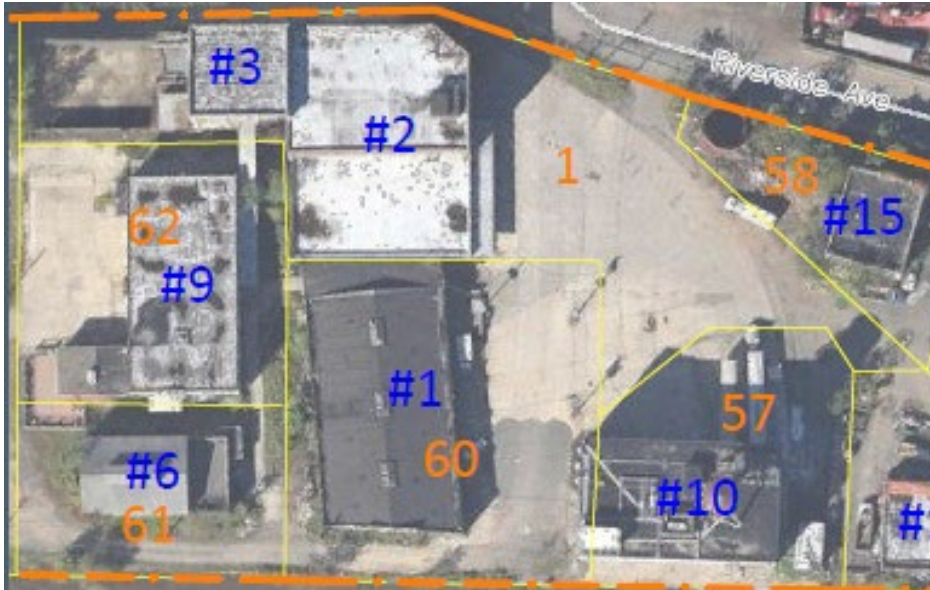
Building #14 is on 0.405 acre on Lot 59 (Figure 2-1). As of November 2019, the property has ongoing industrial operations.



No environmental investigations have been identified at the property. As summarized in the RIR and SCSR, several spills have been associated with Lot 59. Documentation of the specific locations of the spills/releases has not been found.

2.3.5 Lot 60

Lot 60 is 0.703 acre and includes Building #1, and during the RI, had ongoing commercial activities (Figure 2-1).



The property has been subjected to a NJDEP-led remediation. The Site is identified as Roloc/Color Enterprises (PI #467682) with investigation activities occurring in 2009 and 2017. Applicable results from these investigations were considered in the CERCLA RIR and FS.

Following these investigations, First Environment, Inc. (First Environment) (consultant to Responsible Party) determined that no further action (NFA) was required for the soil and a CEA for historic fill impacts to groundwater. The historic fill CEA indicated mercury, arsenic, aluminum, chromium, iron, and lead concentrations were above the NJDEP GWQS. The Responsible Party is awaiting direction from USEPA on implementation of their Remedial Action Work Plan (RAWP) (First Environment, 2017). Refer to RIR Section 1.4.5 for details on previous investigations.

2.3.6 Lot 61

Lot 61 is 0.265 acre and includes Building #6 (Figure 2-1), and during the RI, the property was vacant.



No investigations have specifically addressed potential environmental impacts on this lot. The deed notice filed by the property owner (City of Newark) indicates there is potential for encountering contaminated historic fill beneath Building #6. The concrete building slab is identified as an engineering control. The Responsible Party associated with the deed notice is Honeywell, successor to BBI. The deed notice identifies contaminants associated with the historic fill as being VOCs and metals. The New Jersey PI number is G0000005586. RIR Section 1.4.6 provides details on Lot 61 previous investigations.

2.3.7 Lot 62

Two-story Building #9 is located on Lot 62 (0.492 acre). In November 2019, the building (Figure 2-1) was occupied by a commercial tenant.



In 1998, IDA (property owner) received an NFA determination from NJDEP related to CCI operations. In 2008, an investigation including the collection and analyses of soil and groundwater samples was conducted on behalf of CCI (Whitman, 2012b). The soil samples were considered to be representative of historic fill (Whitman, 2012b). The status of the case is uncertain based on NJDEP files. Refer to RIR Section 1.4.7 for previous investigation details.

2.3.8 Lot 63

Lot 63 is 0.541 acre and contains Building #7 and the former Building #7A (Figure 2-1). The City of Newark is the property owner through foreclosure and as of November 2019, the property is vacant.



A 2010 Building #7 AST inventory by USEPA indicated 10 empty ASTs on the second floor and 93 ASTs (79 empty) located on the third floor. Beginning in late 2011, USEPA started the process of the solid residue removal from the tanks. The majority of the tanks were empty. The tank contents varied from a “caramel-like” substance to a hardened material that required chipping. Simultaneously, USEPA began the process of removing basement liquid and sludge.

In early 2012, Floor 2 and Floor 3 tank work along with basement liquid/sludge removal was stopped due to USEPA budget constraints. In October 2012, Hurricane Sandy caused flooding at the Site. USEPA reported that the basements in Buildings #7 and #15 were flooded after the hurricane. In May 2014, the removal of Building #7 basement liquids and sludges resumed and was completed in August 2014.

The (2009) soil analytical results indicated exceedances of total petroleum hydrocarbon (TPH), VOCs, SVOCs, metals, and polychlorinated biphenyls (PCBs) above NJDEP criteria. The petroleum fingerprint analysis performed on the groundwater sample indicated the presence of mineral spirits and diesel fuel/fuel oil #2 (PMK/Birdsall, 2009b).

Two monitoring wells (ERT-2 and ERT-3) were installed in 2011 on Lot 63. Benzene was the only compound reported above NJDEP GWQS in Lot 63 groundwater (Lockheed Martin, 2011). These monitoring wells were not located or observed during the RI. It is unknown whether the wells were properly decommissioned.

A 2008 deed notice identifies two areas beneath the footprint of Building #7 on the north and east sides as being potentially impacted by historic fill, with the building slab acting as an engineering control. Honeywell is the Responsible Party for maintaining the engineering control. The New Jersey PI number is G0000005586.

In 2017, USEPA initiated an emergency response action to remove debris and biohazard labeled medical waste scattered on the ground (USEPA, 2017). Dumping continued in 2019 on Lot 63. Refer to RIR Section 1.4.8 for previous investigation and remedial action details.

2.3.9 Lot 64

Former Building #5 and Building #12 are on Lot 64 (0.934 acre). The City of Newark is the current property owner through foreclosure (Figure 2-1). As of November 2019, the property is vacant.



Building #5 was demolished in 1982 along with Lot 1 Buildings #3 (northern portion) and #4.

Subsequent to a 2009 inventory, USEPA planned to remove the 10 USTs. The contents were removed, but due to structural integrity concerns, only two tanks were reportedly removed and soil sampling via test pits was undertaken by Tetra Tech Inc. (Tetra Tech) in 2012. A black viscous light non-aqueous phase liquid (LNAPL) sheen/film was observed in several test pits. Because of data quality issues, no usable results were generated from the test pit soil samples. No formal underground storage tank (UST) closure reports have been identified; however, USEPA documentation indicates that 2 of the 10 USTs were removed by USEPA (USEPA electronic correspondence, January 13, 2012).

The October 2009 "The Passaic River Mystery Oil Spill" (Case #09-10-29-1320-36) was attributed to ASTs in the basement of Building #12. According to USEPA documents, the source of the spill was identified at low tide when a pipe discharging the spill was observed. The pipe was sealed, stopping the release. The pipe that discharged into the Passaic River was traced to a catch basin. An oily substance in the discharge was observed in the catch basin; a sewer

pipe from Building #12 was observed to discharge into the basin. The discharge from the Building #12 sewer pipe resembled the spill material observed in the Passaic River. Section V.16 of the ACO states that USEPA traced the source to two basement tanks in a vacant building located on Lot 64 that had recently been connected to a storm sewer by a hose. Based on its investigation during removal activities, USEPA expressed the opinion that contents of the two basement tanks appeared to have been intentionally discharged into the sewer. The sewer line was plugged and tanks secured by USEPA.

As described in the SCSR, a 2009 Preliminary Assessment Report (PAR) for Lot 64 (Weston, 2009) was completed.

Samples were collected by Birdsall (PMK/Birdsall, 2009b) and USEPA (Tetra Tech, 2010a, 2010b and Lockheed Martin, 2010a, 2010b). As part of the Lot 64 investigation, there was one monitoring well installed (ERT-1/2011) on adjacent Lot 65. Benzene and methylene chloride were the only compounds reported above NJDEP GWQS in Lot 65 groundwater (Lockheed Martin, 2011).

In conjunction with the surface waste removal on Lot 63, Lot 64 surface debris and waste were removed by USEPA in 2017 and 2018. Refer to RIR Section 1.4.10 for details on previous investigations and remedial actions.

2.3.10 Lot 65

Lot 65 is a 0.289-acre vacant lot (Figure 2-1). Based upon historical aerial photographs, PPG records, and Sanborn maps, there were no buildings situated on this lot.



No environmental investigation reports have been found which were completed specifically for this lot; however, in 2006, a groundwater sample was collected from a soil boring on Lot 65 for limited parameters. Lead and 4-chloroaniline were detected above NJDEP GWQS at TB-7 (Whitman, 2012a).

Surface debris piles were present in June 2015 along with a vandalized office trailer. Additional surface debris piles were observed in July 2015 indicating an active dumping area for construction and miscellaneous debris. Surface debris and waste were removed by USEPA in 2017 (USEPA, 2017). The office trailer was removed in 2019.

2.3.11 Lot 66

Lot 66 (0.345 acre) contains vacant Building #17 (Figure 2-1) and former Building #17A. The property is currently (July 2015) in bankruptcy. A small building was located west of Building #17 designated on drawings as Building #17A.



An unknown liquid was released to the Passaic River on January 9, 1992 as a result of illegal dumping. CCI was reportedly pumping the contents of a pit into an open lot (NJDEP Case #92-1-9-1027-18).

A July 1992 release to the Passaic River was reportedly caused by the failure of an industrial sewer line. The release likely occurred in the vicinity of Lot 66. The release was described as a blue/purple dye, wastewater liquid with aniline being a component. The location of the sewer line breach was not found in historical records.

One soil boring (SB-COMP) was advanced in May 2008, and a subsurface soil sample was collected and analyzed from the boring. TPH was detected at 1,400 milligrams per kilogram (mg/kg) and polycyclic aromatic hydrocarbons (PAHs) were not detected (Whitman, 2012a).

A 2010 vapor intrusion investigation of Building #17 was performed because of a tetrachloroethylene (PCE) spill on Lot 68. The conclusions indicated that the results for the Celcor Building/Building #17 did not exceed NJDEP vapor intrusion screening limits.

Three TWP's were installed on Lot 66 and grab groundwater samples were collected in 2006. NJDEP GWQS exceedances of isopropylbenzene, chromium, and lead were identified northwest of Building #17 (upgradient, TB-4 and TB-5). NJDEP GWQS exceedances of carbon disulfide, benzo(a)anthracene, benzo(a)pyrene, chrysene, fluoranthene, pyrene, chromium, and lead were identified at TB-6 located downgradient of the wastewater AST. One monitoring well (MW-2) was installed and sampled in 2008 and is identified as RI existing Well E-2.

In July 2015, surface debris and waste piles were present and removed by USEPA in 2017 under an emergency response action (USEPA, 2017). CCI Monitoring Well MW-2 is present on the east side of Building #17 (Lot 66) and was evaluated and sampled during the RI. This well is E-2 in the RI. The status of the ISRA remediation of this lot is unclear based on NJDEP records. Refer to RIR Section 1.4.11 for previous investigation details.

2.3.12 Lot 67

Lot 67 is a 0.394-acre vacant lot owned by CCI (Figure 2-1). According to USEPA, the property went through bankruptcy proceedings. A small building with unknown use exists on the eastern side of the lot adjacent to the Passaic River.



According to public records, Lot 67 could be the location of the pit mentioned in allegations of CCI's 1992 illegal dumping on an open lot (NJDEP Case #92-1-9-1027-18).

The southwestern portion of Lot 67 is under a groundwater CEA and deed notice with engineering controls to address groundwater impacts and soil contamination related to historic fill and a Lot 68 PCE spill in 1987 (RIR Figure 1-3). Honeywell is responsible for maintaining the CEA as well as the engineering controls. The New Jersey PI number is G0000005586.

Soil samples were collected in 2008 from Lot 67 with several metals and SVOCs detected above USEPA Regional Screening Levels (RSL) (industrial) or Impact to Groundwater Soil Screening Levels (IGWSSL) (Whitman, 2012a). Soil data obtained from the three borings indicated that TCE (up to 0.13 mg/kg), lead (up to 950 mg/kg), mercury (up to 0.18 mg/kg), and benzo(a)pyrene (0.58 mg/kg) were detected.

In July 2015, surface debris piles along with abandoned equipment were present. USEPA removed these piles in 2017 under an emergency response action (USEPA, 2017). Refer to RIR Section 1.4.12 for previous investigation details.

2.3.13 Lot 68

Lot 68 is a 0.534-acre vacant lot owned by the City of Newark (Figure 2-1). Former Building #20, referred to as a shed, was located along the southern property line of this lot. The majority of the property was covered with asphalt based upon June 2015 observations. During PPG operations, two naphtha ASTs with 5-foot-high dike containment walls were present along with a 1,400-square foot (SF) drum storage shed (Building #20). The naphtha AST area is currently overgrown and covered by a debris pile. In 2019, vegetation was removed from the former AST area by a City of Newark tenant.



A PCE spill occurred in 1987. Delineation of the spill-related contamination was performed and a cleanup plan developed (Dunn, 1990, 1991, and 1992). Soil was removed from the lot in April 1992. Post-remediation soil sampling was conducted in 1995 (Rust, 1995).

Lot 68 is a New Jersey known contaminated site (NJDEP Case No. 88434). A deed notice with an engineered asphalt/concrete cap is present related to shallow soil impacts of arsenic, lead, PCE, trichloroethene (TCE), and zinc. There is also a groundwater CEA covering *cis*-1,2-dichloroethene (DCE), *trans*-1,2-DCE, PCE, TCE, and vinyl chloride. Honeywell is responsible for maintaining the CEA as well as the engineering controls. The New Jersey PI number is G0000005586. Details on Lot 68 previous investigations and remedial activities are in RIR Section 1.4.13.

2.3.14 Lot 69

Building #13 is located on Lot 69. Lot 69 is the northern most parcel with a size of 0.326 acre (Figure 2-1). The property is currently owned by Sharpmore Holdings, Inc. (Sharpmore). Old, inactive Ardmore tanks are located to the north and south of the building. The small garage building along the river is currently used for storage (Building #19).



In 1989, three areas of potential environmental concern, including a drum handling area, the loading dock area, and the tractor trailer product transfer area, were identified and excavations were completed with visually contaminated soil removed. Confirmatory soil samples were collected from the excavations. The Responsible Party's (Gloss Tex) post-remediation soil samples collected from the three excavation areas indicated petroleum hydrocarbon (PHC) and base neutral (BN) concentrations below New Jersey standards at the time (AccuTech Environmental Services, 1989). A negative declaration affidavit was submitted to the NJDEP in November 1989 indicating no additional remedial measures were warranted. Refer to RIR Section 1.4.14 for previous investigation details.

2.3.15 Lot 70

Building #16 (Figure 2-1) is on Lot 70 (0.456 acre). As of November 2019, the property has a commercial tenant.



A Responsible Party (Federal) spilled an unknown quantity of nitrocellulose in 1990 and released hydrochloric acid gas in 1993. Federal assessed groundwater quality in 2001. Groundwater contained elevated concentrations of acetone (14,000 to 29,000 milligrams per liter [mg/L]), barium, and lead above the NJDEP GWQS. The occurrence of acetone was attributed to an adjacent property (Lot 57 – HABA acetone release).

Other assessments, investigations and remedial action at Lot 70 began in 2001. According to the 2008 RAWP (TRC Environmental Corporation, 2008), the NJDEP agreed to list the groundwater CEA contaminants related to historic fill (arsenic, barium, cadmium, lead, and zinc) for Lot 70 and directed Federal to list benzene as a site chemical of concern in the CEA. The CEA for Lot 70 was reportedly established on March 30, 2010 for an indeterminate duration.

In March 2012, soil with PCB concentrations greater than 50 parts per million (ppm) was excavated. A deed notice was recorded on December 4, 2014, restricting the Site to non-residential use only and includes engineering controls. Refer to RIR Section 1.4.15 for details on previous investigations and remedial actions.

2.3.16 Institutional and Engineering Controls

Portions of five lots within the Site are currently subject to NJDEP Deed Notice/Declaration of Environmental Restriction (DER), which are institutional controls that limit use of the properties to non-residential uses. Also, several CEAs are



established or proposed under NJDEP-led remediations (Figure 2-2). CEAs proposed but not approved by NJDEP are not on Figure 2-2 and were not considered in the risk assessments.

Lot 1

A historic fill CEA (arsenic, iron, lead, manganese, and sodium) was proposed for Lot 1 in 2017 by Samax under New Jersey PI #563216. Samax is awaiting direction from USEPA on implementation of the CEA.

Lot 60

In 2017, a historic fill CEA was submitted to NJDEP on behalf of Roloc for Lot 60. The CEA indicated mercury, arsenic, aluminum, chromium, iron, and lead concentrations were above the NJDEP GWQS. The Responsible Party is awaiting direction from USEPA on implementation of the CEA.

Lot 61

The deed notice filed by the property owner (City of Newark) indicates there is potential for encountering contaminated historic fill beneath Building #6 on Lot 61 (Figure 2-2). The concrete building slab is identified as an engineering control. The Responsible Party associated with the deed notice is Honeywell, successor to BBI. The deed notice identifies contaminants associated with the historic fill as being VOCs and metals. The New Jersey PI number is G0000005586.

Lot 63

A 2008 deed notice identifies two areas on Lot 63 beneath the footprint of Building #7 on the north and east sides as being potentially impacted by historic fill, with the building slab acting as an engineering control (Figure 2-2). Honeywell is the Responsible Party for maintaining the engineering control. The New Jersey PI number is G0000005586.

Lot 67

The southwestern portion of Lot 67 is under a groundwater CEA and deed notice with engineering controls to address groundwater impacts and soil contamination related to historic fill and a Lot 68 PCE spill (Figure 2-2). Honeywell is responsible for maintaining the CEA as well as the engineering controls. The New Jersey PI number is G0000005586.

Lot 68

Lot 68 is a New Jersey known contaminated site (NJDEP Case No. 88434). A deed notice with an engineered asphalt/concrete cap is present related to shallow soil impacts of arsenic, lead, PCE, TCE, and zinc. There is also a groundwater CEA covering *cis*-1,2-DCE, *trans*-1,2-DCE, PCE, TCE, and vinyl chloride (Figure 2-2). Honeywell is responsible for maintaining the CEA as well as the engineering controls. The New Jersey PI number is G0000005586.

Lot 69

An abandoned off-site petroleum bulk storage facility to the north of Lot 69 has a CEA that extends onto Lot 69. The CEA is for benzene; however, benzene was below the NJDEP GWQS in the on-site portion of the CEA area during the RI.

Lot 70

Lot 70 May 1998 DER was terminated and replaced by a deed notice recorded on December 4, 2014, restricting the Site to non-residential use only. In August 2014 engineering controls (4-inch-thick asphalt cap over the entire exterior of the parcel) were installed and are included in the deed notice. A 2010 historic fill CEA (arsenic, barium, cadmium, lead, and zinc) was established for Lot 70.

2.4 Physical Characteristics of the Site

2.4.1 Surface Features

The majority of the Site (70 percent) is covered with impervious surfaces, such as asphalt (approximately 19 percent), foundation and buildings (approximately 27 percent), and concrete (approximately 24 percent). The remaining portion of the Site is indicated to be pervious (approximately 30 percent) (Figure 2-3).

There are 14 buildings at the Site with five of the buildings being vacant (Buildings #6, #7, #12, #15, and #17). At the time of the RI, Buildings #1, #2, #3, #9, #10, #13, #14, and #16 had ongoing business operations along with a small garage building (Building #19) that was used for storage by the occupant of Building #13. The southern portion of the Site is primarily vacant with four of the five unoccupied buildings located there. Former Building #4 was damaged by fire and was demolished in 1982, a sub-grade concrete slab with concrete walls is currently present that was previously used by post-PPG occupants as secondary containment for multiple ASTs and also for auto-dismantling activities. Former Building #5 was also damaged by fire and demolished in 1982, a vegetated soil mound currently occupies much of the footprint of the building. Debris/soil mounds are also present within a former AST dike on Lot 68 and on the south side of Building #15 on Lot 58. These soil mounds are of unknown origin.

Smaller structures that are present on the Site include a vacant guard-shack at the entrance to the Site along Riverside Avenue and a small concrete structure of unknown use on the eastern side of Lot 67.

Empty ASTs and/or process vessels are present on the exterior of Lots 58, 67, and 69. The empty AST on Lot 58 is a remnant feature from PPG occupation.

At initiation of the RI, un-authorized surface dumping was prevalent in the southern portion of the Site. Under an emergency removal action, these surficial wastes removed by USEPA in 2017 and 2018 included asbestos-containing materials, household trash, construction debris, bio-hazard waste, and petroleum-impacted materials (USEPA, 2017).

The Passaic River borders the Site on the east side. A steel, concrete, or wooden bulkhead provides a retaining wall along the eastern edge of most of the Site adjacent to the Passaic River. The bulkhead has fallen into disrepair in some locations.

2.4.2 Surface Water Hydrology

An assessment of current topography and resulting surface water patterns at the Site was undertaken in the RI (RIR, Section 3.2). Approximately 15 percent of site surface drains toward the west (railroad tracks and Riverside Avenue) while approximately 57 percent of the Site drains toward the east. The remaining area (28 percent) is occupied by buildings or hydraulically isolated structures.

The Passaic River has a history of high water events. The topographic survey map of the Site (RIR, Figure 3-2A) has ground surface elevations that range from approximately 6 to nearly 12 feet above mean sea level (AMSL). It appears that 40 to 50 percent of the Site lies at an elevation of 9 feet below mean sea level (MSL) (which is designated by FEMA as the 100-year flood elevation), including Buildings #6, #10, #13, #14, and #16, and portions of Buildings #1, #7, and #9. The top of the river bulkhead is between 6 and 7 feet MSL. This means water levels above 6 feet MSL would cause high water at some portions of the Site, and water levels of 9 feet MSL would represent a 100-year flood at the Site.

2.4.3 Geology and Hydrogeology

The Site consists of large quantities of fill material that were historically placed into the river and adjacent shore to raise the surface elevation to today's approximate elevation, most of which was completed from 1892 to 1909. The majority

of the current lots that comprise the Site is located within the footprint of the historical Passaic River. The thickness of fill material ranges in thickness from 6 to 15 feet. The fill material consists predominantly of sands, silts, and gravel along with man-made materials such as brick, pieces of concrete block, wood, glass, and cinders. The fraction of each material in the fill varies across the Site, however, most of the historic fill material at the Site is characterized as a Loamy Sand or Sand Loam. Based upon historical maps, previous investigations, and data obtained during the RI, fill material is present in surface soils throughout the Site and in subsurface soils where historical filling was conducted to reclaim land from the Passaic River. This material is considered "historic fill" as it complies with the NJDEP definition of historic fill and, therefore, is impacted by chemicals and metals as shown by RI data and NJDEP historic fill designations. Historic fill may also have been impacted due to historical and/or current operations and recent and illegal disposal. Lower portions of the fill are saturated as evidenced by groundwater depths that are typically less than 6 feet below grade. A silt loam underlies the fill unit over the majority of the Site except in areas to the northwest. The sources of fill are unknown. As fill placement occurred over a more than 30-year period, the sources and thus physical and chemical properties could be different.

The silt loam is underlain by alluvium deposits. Two groundwater units were investigated: shallow fill and deep. The primary groundwater flow direction in the shallow fill unit and deep unit is to the east toward the Passaic River.

Groundwater elevations are and were typically influenced by tidal changes which are greatest in areas adjacent to the river. The tidal influences were observed in both the shallow fill unit and deep unit. Tidal influence appears to be greater in the northern portion of the Site compared to the southern portion.

RIR Sections 3.3 and 3.4 provide details on Site geology and hydrogeology.

2.4.4 Demography and Land Use

The Site is located within a designated "Dedicated Industrial Zone" allowing commercial and industrial uses and is subdivided into 15 properties. Currently, seven properties are in use and eight properties are vacant. Seven occupied properties (Lots 1, 57, 59, 60, 62, 69, and 70) and three of the vacant properties (Lots 65, 66 and 67) are owned by several entities, and the other five vacant properties (Lots 58, 61, 63, 64, and 68) are owned by the City of Newark. The Site is partially fenced. Based upon observations during the RI, 30 to 40 employees work in the several businesses (warehousing/storage, distribution, or manufacturing) at the Site. There are no residents at the Site.

Surrounding properties include an abandoned petroleum bulk storage facility to the north of Lot 69; an auto body/salvage business to the northwest of Lots 58, 59, and 69 across Riverside Avenue; a construction contracting business to the south of Lots 67 and 68; and a residential neighborhood to the west of McCarter Highway. According to historical maps, the adjoining properties to the north and northwest have been used for fuel oil storage, a retail gas station, and a coal yard.

Based on U.S. Census Bureau data, as of 2017, Newark's population is diverse with African American being the largest group followed by Hispanic/Latino, together making up over 75 percent of the population. Median household income is \$34,826. Population density is 11,458 per square mile. English is a second language in almost 50 percent of households.

2.4.5 Ecology

The Site is mostly paved or covered by buildings and is partially fenced. Because habitat is restricted, ecological receptors on Site are limited to urban wildlife. Some previous areas of the Site include opportunistic, low-value ecological habitat that is primarily interspersed between the paved areas and/or buildings and foundations. This habitat is in various stages of growth and/or regrowth due to disturbances from remedial activities. Several types of flora and fauna are present on Site, although most are opportunistic or invasive species. Waterfowl are transient visitors. No raptors or deer have been observed, and no wildlife (other than passerines) was observed during the site visit. Feral



cats are prevalent among the vacant buildings. There are no aquatic resources on Site. However, the Passaic River and a tidal mudflat are adjacent to the eastern edge of the Site. The SLERA contains details on ecological conditions at the Site.

2.5 Nature and Extent of Contamination

This section summarizes the nature and extent of contamination presented in RIR Section 4. In the assessment of nature and extent, sample analytical results were compared to Project Action Levels (PALs) or other screening values such as hazardous waste characteristics. Exceedance of a PAL does not indicate an unacceptable risk to that media. PALs are screening values that can help decision makers target a course of action prior to the risk assessment.

2.5.1 Waste

There are a limited number and volume of waste containers and materials (not associated with current operations) observed and sampled in the RI. The limited volume of waste materials is consistent with waste removal actions undertaken by USEPA at the Site. The wastes are not characterized as hazardous wastes based on RI results. LNAPL, identified as diesel/heating oil, is present in a UST (Lot 64) and Building #15A (Lot 58).

Six USTs were identified in a tank field north of Building #12. All six USTs contained liquid that was sampled; five tanks did not contain liquids identifiable as a product or waste product, and groundwater and/or surface water infiltration may have occurred. One UST (UST-5) was found to contain a diesel/heating oil layer approximately 0.9-foot thick. Based on the laboratory waste characterization results, none of the UST liquid was classified as a hazardous waste. The primary VOCs (xylenes and ethylbenzene) reported in nearby groundwater wells (MW-106 and E-3) are the same as the VOCs in the tanks. UST-7 also contained several chlorinated VOCs above 100 µg/L. UST-7 still has the same two primary VOCs (xylenes and ethylbenzene) as other USTs but the lack of chlorinated VOCs in the other tanks indicates that these other tanks held different material. Because UST VOC concentrations from five USTs are higher than nearby groundwater, these tank contents remain a potential source of groundwater contamination.

Based on results, Building #15 standing water was not considered a waste. Water was found beneath a steel grated floor in this portion of Building #15A (pump house). A viscous non-aqueous phase liquid (NAPL) layer was identified consistent with diesel/heating oil approximately 0.5-foot to 0.65-foot thick.

2.5.2 Soil

Surface, subsurface, and vadose zone soils were sampled during the RI. Soil samples collected in 2017 focused on potential AOCs including loading docks, material handling areas, and raw material storage areas (Figure 2-5). Soil samples collected in December 2018 (Phase 2) were based on the 2017 soil results and included investigation of the saturated zone along with providing spatial coverage at the Site. Additional details on soil results are provided in RIR Section 4.

The majority of the Site (except the northwest section) was reclaimed from the Passaic River with imported fill. Fill material is documented at the surface throughout the Site with greater fill thicknesses associated with areas reclaimed from the Passaic River (up to 15 feet thick) and is generally described as a Loamy Sand or Sand Loam in most areas. Permeability testing conducted on two soil samples collected beneath the fill unit representative of the former river bed indicated permeabilities of 1.1×10^{-5} to 3.3×10^{-7} centimeters per second (cm/s). Geotechnical data provided by USEPA indicated that this former riverbed material beneath the fill is more appropriately described as a silt loam. The silt loam layer grades into a fine to coarse-grained sand and gravel with depth which includes alluvium deposits (Qal) and glacial lake deltaic deposits (Qbn) followed by a silt unit (Qbnl) identified as glacial lake bottom deposits.

Observations of a thick, oil-like substance were noted at Borings B-34, B-35, and B-90 east and south of the UST area. Monitoring wells in the vicinity of the USTs did not have a measurable thickness of NAPL; however, a TWP installed at



B-34 contained LNAPL. Isolated areas of LNAPL staining were also observed in soil during the drilling of Monitoring Well MW-201 between the ground surface and 7.2 feet below ground surface (bgs). Monitoring wells in this area of the Site (including Monitoring Well MW-201) did not have a measurable thickness of LNAPL.

Thirty-four VOCs (67 percent) were not detected in soil samples or not reported at concentrations above their PALs. Eight VOCs were identified as soil chemicals of potential concern (COPCs) in the BHHRA. The VOCs that exceeded a PAL most frequently were benzene, methylene chloride, PCE, and TCE. Although toluene, ethylbenzene, and xylene (TEX) (total) were reported at elevated concentrations, most results were below their PALs. The source of benzene, toluene, ethylbenzene, and xylenes (BTEX) on Lots 63 and 64 is likely the petroleum waste in USTs and soil and recent illegal storage or recent dumping. The highest chlorinated VOC results were from Lot 68 where a PCE release occurred in 1987. BTEX was also reported in that area. The likely source of these VOCs are illegal dumping and residual contamination from the PCE spill. BTEX and chlorinated VOCs were detected around Building #15. The likely source is recent spills in the area. Elevated acetone concentrations were reported in subsurface soil on Lot 57, but the results were less than 60 percent of the acetone PAL. The source of acetone is likely the acetone storage area associated with current operations on Lot 57.

Fifty-six SVOCs did not exceed PALs. Eight SVOCs were identified as COPCs in the BHHRA. SVOCs above a PAL were widespread with the majority being on Lots 63, 64, 67, and 68 in surface soil. Benzo(a)pyrene was the SVOC with the most PAL exceedances. Of the SVOC detected above PALs, benzo(a)pyrene and dibenzo(a,h)anthracene have the lowest PAL at 110 micrograms per kilogram ($\mu\text{g/kg}$). The sources of the SVOC above PALs are likely a combination of historic fill, illegal petroleum material spills/storage, petroleum waste in USTs, and surrounding area historical/current operations.

Twenty-four metals including mercury were analyzed in soil samples. The highest lead and zinc soil concentrations were generally on Lots 63, 64, and 70. The majority of zinc concentrations were below PAL on these lots and the other 12 lots. Mercury was detected in the majority of soil samples above its PAL (0.1 mg/kg) with most PAL exceedance on the southern portion of the Site. The source of the metals is likely a combination of historic fill, operations releases, and illegal dumping.

PCB-1254 exceedances were mostly concentrated on the southern portion of the Site in Lots 63, 64, and 65. PCB-1260 exceedances were almost entirely from surface samples collected in the northern portion of the Site and were found on Lots 58, 69, and 70. An NJDEP-led PCB soil excavation occurred on Lot 70.

No pesticides/herbicides, except heptachlor epoxide, were detected in soil samples.

Dioxin/furan results for four of the nine surface soil samples exceeded the PAL for 2,3,7,8-tetrachlorodibenzoparadioxin (TCDD); the highest 2,3,7,8-TCDD concentration was detected at location DF-4 at 20.8 nanograms per kilogram (ng/kg). The four highest 2,3,7,8-TCDD soil results are on the eastern edge of the Site adjacent to the Passaic River.

2.5.3 Groundwater

The RI characterized the nature and extent of groundwater quality beneath the Site. There are 31 monitoring wells in the shallow fill unit (eight wells were present prior to RI) and five monitoring wells in the deep unit. The primary groundwater flow direction in the shallow fill unit and deep unit is to the south-southeast toward the Passaic River.

Evaluation of slug test data for shallow fill unit wells at the Site indicated hydraulic conductivities between approximately 4 and 233 ft/day. While the data indicate a range of approximately three orders of magnitude for hydraulic conductivity, the fact that many of the wells are constructed in shallow fill materials suggests this range is reasonable given the heterogeneity of fill. Slug test data for wells in the deep unit indicated higher hydraulic conductivities in the north (average of approximately 210 feet per day [ft/day]) compared to hydraulic conductivities in the south (average of approximately 44 ft/day).

Tidal fluctuations in the deep unit also indicated that deep wells on the north end of the Site also appear to exhibit more tidal influence suggesting that the subsurface materials on the more northern and inland portions (near MW-205) are more conductive or better connected to the river than areas to the south. Unfiltered groundwater samples were collected and analyzed in March 2018, June 2018, and February 2019. The Phase 1 wells including the pre-RI wells have been sampled three times within a year, while the Phase 2 wells were sampled once. Additional groundwater quality information is provided in RIR Section 4.4.

2.5.3.1 Shallow Fill Unit

Over the three sampling events, results for the shallow fill unit well samples were consistent except as noted below. Variations for many of the results may be within reproducibility range of measurement or reflect site conditions at the time of sampling (seasonal variations, tides or recent precipitation events). More significant VOC concentration changes in the shallow fill unit wells are noted below.

- Monitoring Well E-4: Ethylbenzene concentrations increased from not detected in the two 2018 samples to 48 µg/L in 2019. 2018 TCE concentrations changed from non-detect to 5.6 µg/L in 2019.
- Monitoring Well MW-106: Concentrations from 2018 to 2019 for ethylbenzene, TCE, and xylenes decreased.
- Monitoring Well MW-107: Benzene, ethylbenzene, and xylenes decreased in 2019 from 2018 results.
- Monitoring Well MW-115: Ethylbenzene and xylenes concentrations decreased since March 2018 while benzene and other VOC concentrations have remained consistent.
- Monitoring Well MW-117: Methyl ethyl ketone (MEK) concentrations increased from not detected in 2018 to 330 µg/L in 2019.

Monitoring Well MW-124 was installed in Phase 2 and sampled once. It has the highest TEX concentrations in the shallow fill unit.

VOCs: Benzene detections were the most common VOC to exceed the PALs in the shallow fill unit, followed by vinyl chloride, ethylbenzene, 1,1,2-trichloroethane (TCA), 1,1,2,2-tetrachloroethane, and m,p-xylenes. Fourteen VOCs including benzene, vinyl chloride, ethylbenzene, 1,1,2-TCA and xylenes (total) are groundwater COPCs in the BHHRA.

SVOCs: 1,4-Dioxane was the most common SVOC detected (above PALs) followed by naphthalene, benzo(a)anthracene, benzo(a)pyrene, and 1,1'-biphenyl in the shallow fill unit. Twelve SVOCs were identified as COPCs.

Metals: Arsenic, manganese, iron, sodium, cyanide and lead were detected most often above their respective PALs. Mercury was not detected above its PAL. Eight other metals were detected above their PALs in at least one sampling event.

PCBs: Aroclor 1260 was detected in groundwater above its PAL at four shallow fill unit well locations during at least one sampling event (MW-108, MW-118, MW-119, and MW-121). One other PCB (Aroclor 1254) was detected above its PAL in one sampling event.

NAPLs: Measurable LNAPL was not observed in shallow fill unit monitoring wells. LNAPL was observed in soil in the area of Lot 64 USTs. No dense non-aqueous phase liquid (DNAPL) was observed in the RI monitoring wells.

The groundwater areas with the highest concentrations above PALs are as follows:

- Lots 63/64
- Lot 58/Building #15
- Lot 57/Building #10

The first two areas above are contaminated with BTEX and chlorinated solvents. Lot 57 contamination is primarily acetone. Arsenic and lead concentrations above PAL are site-wide with the most exceedances on Lots 63/64. 1,4-dioxane concentrations above PAL were primarily along the river.

2.5.3.2 Deep Unit

The number of parameters above PAL is less in the deep unit groundwater than in the shallow fill unit. Concentrations were also lower in the deep unit.

VOCs: Benzene, 1,1,2,2-tetrachloroethane, and 1,1,2-TCA were the most common VOCs to exceed their PAL in the deep unit groundwater. The methyl tert-butyl ether (MTBE) PAL exceedance is unique to the deep unit as it was not detected in a shallow fill unit well above its PAL. Ten VOCs including MTBE were identified as deep unit COPCs in the BHHRA.

SVOCs: In the deep unit groundwater, naphthalene was the most common SVOC detected exceeding its PAL. Three SVOCs were identified as COPCs in the BHHRA.

Metals: Arsenic, manganese, and sodium were detected most often above their respective PALs in deep unit groundwater. Eight metals were identified as COPCs in the human health risk assessment.

PCBs: No PCBs were detected in deep unit groundwater.

NAPLs: LNAPLs or DNAPLs were not observed in deep unit monitoring wells.

2.5.4 Sump

Sumps were identified in Buildings #2, #4 (demolished), and #17 and were sampled in conjunction with groundwater sampling events. The results were compared to groundwater PAL although, as noted below, several sumps do not contain groundwater.

The Building #2 sump is in the basement and has a pump with an on/off float that conveys water to a sewer pipe. The water in the sump was sampled twice. No odors or sheen were noted at the time of sampling. Chloroform, benzo(a)pyrene, arsenic, sodium, and Aroclor 1260 were reported at concentrations above PAL. Aroclor 1260 and benzo(a)pyrene were only detected once above PALs. It is noted that several VOC results were rejected and unusable as quantified results. The closest monitoring well (E-9) to this sump had similar chloroform concentrations and no other VOC PAL exceedances consistent with the Building #2 sump. Chloroform was detected (0.98 microgram per cubic meter [$\mu\text{g}/\text{m}^3$]) in the Building #2 basement indoor air. The Building #2 sump is below grade and regularly pumps water, indicating it may be communicating with the shallow fill unit groundwater.

The Building #4 sump is in the floor slab of the demolished Building #4. At the beginning of the RI, vehicle dismantling occurred on the former Building #4 concrete slab. The sump is exposed to weather, and no VOCs were reported above groundwater PALs. Several SVOCs and metals were above PALs. Aroclor 1260 was detected above its PAL. The contents of the sump represent precipitation runoff from the Building #4 floor slab and not groundwater.

There are two sumps inside the vacant, deteriorating Building #17. The sumps are in the bottom floor which is partially below grade. This floor becomes submerged by water after precipitation events resulting in a determination that the liquids in the sumps are suspected to be related to precipitation entering into the building and not groundwater. No VOCs were above the groundwater PALs. No PCBs were detected. 1,4-Dioxane (Sump 2 only) and several metals were above groundwater PALs. Additional details on sump results are provided in RIR Section 4.5.

2.5.5 Sewer

The assessment of the sewer system resulted in the collection of water samples at four Lot 1 manholes. Samples from Manholes 17 and 20 were from active sewers where site tenants/owners are discharging to these publicly owned treatment works (POTW) sewers.

Three of the four sewer water samples had no PAL exceedances. Manhole 8 (Lot 1) had methylene chloride and TCE above the PALs. A solid sample collected from Manhole 8 contained methylene chloride and toluene concentrations that were above 1 mg/kg. Two SVOCs and several metal concentrations were above 1 mg/kg. The sewer at this location was classified as inactive based on observations of no flow and lack of current users upstream of the location.

The water and solid results at Manhole 8 were higher than nearby groundwater concentrations. The source of VOCs in this manhole is unknown but a former recent operator used VOCs in its manufacturing operations. This is an inactive sewer at this location and based on results, its contents would be a source material, if released into the environment. Based on RI results, other sewer locations are not sources of groundwater or soil impacts reported in the RI. Additional details on sewer results are provided in RIR Section 4.6.1.

2.5.6 Lot 57/Sewer Pipe and Groundwater

The Lot 57 wall sewer sample contained elevated toluene and acetone concentrations. Other VOC results were rejected due to holding time exceedances except for toluene and acetone. The acetone concentration was 83,000 µg/L. Concentrations of ethyl acetate (a tentatively identified compound [TIC]) was estimated to be 7,000 µg/L. TIC concentrations are estimates because the target compound is tentatively identified by the laboratory instrument. Additional details on Lot 57 sewer water results are provided in RIR Section 4.6.2.

The nearest shallow fill well (MW-118) to the wall sewer sample had acetone concentrations from 51,000 to 71,000 µg/L. Ethyl acetate was not identified as a TIC in this well. Ethanol and isopropyl alcohol had the highest concentrations of VOC TIC reported in this well.

The deep unit well (MW-204) adjacent to MW-118 was non-detect for acetone and ethyl acetate. Ethanol and isopropyl alcohol were not identified as TICs in this deep well.

In the wall sewer sample, SVOCs and PCBs were below PALs with one metal (lead) exceeding the PAL. Various metals were present at concentrations below 50 µg/L in the wall water sample.

The flow from the pipe increased during sampling indicating that the source may not always be a passive source. An additional VOC sample can be collected to more fully characterize this water, but the presence of acetone and likely ethyl acetate in the wall sewer pipe and acetone in shallow groundwater indicates this water in the pipe and well should be evaluated in the FS to assess whether manufacturing activities in Building #10 are contributing to groundwater and surface water contamination.

2.5.7 Indoor Air

Indoor air and exterior ambient air samples were collected and analyzed from occupied buildings (Buildings #1, #2, #3, #9, #10, #14, and #16) during the heating season (as defined by NJDEP). The samples were analyzed for benzene, ethylbenzene, xylenes, 1,1,2-TCA, carbon tetrachloride, chloroform, isopropylbenzene, naphthalene, TCE, and vinyl chloride.

Benzene concentrations were above its PAL ($0.36 \mu\text{g}/\text{m}^3$) in each building's indoor air and also in ambient air. Chloroform was above its PAL in Buildings #2, #10, and #14. Ethylbenzene and TCE concentrations in Building #1 were above PALs. Other parameters were not above a PAL. In addition to benzene, xylenes were detected in ambient air.

The three highest VOC concentrations in ambient air are as follows:

- $0.99 \mu\text{g}/\text{m}^3$ - m,p-Xylene
- $0.76 \mu\text{g}/\text{m}^3$ - Benzene
- $0.45 \mu\text{g}/\text{m}^3$ - o-Xylene

Operations in several buildings (Buildings #9, #10, #14 and #16) sampled use organic solvents in their process or routinely have gasoline/diesel powered vehicles/equipment in the building sampled. Gasoline/diesel equipment was not operating during sampling. RIR Section 4.7 provides additional details on indoor and ambient air samples.

2.6 Fate and Transport

VOCs, SVOCs (represented by PAH compounds and PHCs), metals, PCB aroclors, and TCDD have been detected in soil and groundwater.

Biodegradation of some compounds like VOCs is rapid. SVOCs and metals at the Site are less susceptible to degradation and, therefore, are relatively persistent in the environment. The RI did not include a monitored natural attenuation (MNA) study at the Site. In addition to biodegradation, the chemical solubility, volatility, and its tendency to absorb to soil, all affect the fate and movement through soil and groundwater.

Potential transport interactions at the Site include the following:

- Overland stormwater
- UST contents to groundwater
- Soil to groundwater
- One sewer manhole to soil/groundwater
- Groundwater - surface water interaction
- River - site soil interaction
- Soil gas to indoor air
- Soil to airborne dust
- One sewer pipe (P57-1)

Additional details on fate and transport in RIR Section 5.

2.7 Risk Assessments

The BHHRA and SLERA for the Site were prepared by Ramboll and provide the full details on these assessments. Both risk assessments were performed without consideration of existing or planned engineering and institutional controls.

To summarize the risk assessments, response actions are being evaluated for unacceptable human health risks, which will address copper (Lot 63), lead (Lots 1, 61, 62, 63, 64, 65, 68, and 70), VOCs (Lots 58 and 68), and naphthalene (Lot 62) contamination, and the response action for these contaminants and areas will consider the potential ecological risk identified in the SLERA. Additional response actions will be evaluated for Lot 67 and Lot 69, where the SLERA identified unacceptable ecological risk with hazard quotients (HQs) greater than 1 in surface soil (refer to Figure 8-1).

The significance of potential exposures to concentrations of COPCs in soil, indoor air, and groundwater was evaluated based on conservative estimates of reasonable maximum exposure (RME) under current and potential future land use at the Site. The significance of potential exposures was determined by comparing estimates of cumulative cancer risks to the National Contingency Plan (NCP) risk range (10^{-4} to 10^{-6}) and non-cancer hazard indices (HIs) to the protection goal of 1.

Under current land use, the potentially exposed populations at and around the Site are conservatively assumed to include outdoor workers (only at occupied Lots 1, 57, 59, 60, 62, 69, and 70), indoor workers (only at occupied lots), utility workers, construction workers (only at lots slated for redevelopment in the near future, which are Lots 57, 58, 61, 63, 64, 68, and 70), trespassers, visitors (only at occupied lots), and off-site workers and residents (via wind transport).

Under future commercial/industrial land use, the potentially exposed populations at and around the Site are conservatively assumed to be the same as for current land use except that each of the 15 properties are evaluated for all receptors (i.e., receptors may be present at redeveloped lots). The potentially exposed populations at and around the Site are conservatively assumed to include outdoor workers, indoor workers, utility workers, construction workers, trespassers, visitors, off-site workers (via wind transport and future shallow groundwater migration), and off-site residents (via wind transport).

As required by USEPA, the BHHRA includes a hypothetical residential scenario which assumes the Site will have medium-density residential units. Additionally, hypothetical potable shallow and deep groundwater use is evaluated for on- and off-site workers, visitors and residents to facilitate development of appropriate institutional controls for the Site.

The COPC, lot, and medium under current and future commercial/industrial land use that have cumulative cancer risks greater than the NCP risk range (10^{-4} to 10^{-6}), or non-cancer HIs greater than the protection goal of 1, or for lead, exceedance of 800 mg/kg (USEPA Region 2 non-residential screening level) or greater than a 5 percent probability that estimated blood lead levels are above 5 microgram per deciliter ($\mu\text{g/dL}$) are as follows:

Lot	Receptor	COPC	Medium
Current Use:			
1	Visitors	Lead	Soil
61	Construction worker	Lead	Soil
62	Visitors	Lead	Soil
63	Trespasser, construction worker	Lead	Soil
64	Construction worker, trespasser (B-75)	Lead	Soil
68	Construction worker	Lead	Soil
70	Construction worker, trespasser, outdoor worker, visitors	Lead	Soil
Future Use:			
1	Visitor – child	Lead	Soil
58	Indoor worker (vapor intrusion)	TCE, xylenes	Soil
61	Construction worker	Lead	Soil
62	Indoor worker (vapor intrusion)	Naphthalene	Soil
	Construction worker, Visitor - child	Lead	Soil
63	Outdoor worker, indoor worker (dust), trespasser, construction worker, visitor - child	Lead	Soil
	Visitor - child	Copper	Soil

Lot	Receptor	COPC	Medium
64	Construction worker, visitor - child, outdoor workers and trespassers (B-75)	Lead	Soil
65	Construction worker, visitor - child	Lead	Soil
68	Construction worker, visitor - child	Lead	Soil
	Indoor worker (vapor intrusion)	TCE	Soil
70	Outdoor worker, trespasser, construction worker, visitor - child	Lead	Soil

Note: All COPC or chemicals of potential ecological concern (COPEC) that have risks/hazards in excess of applicable criteria/standards are carried through to the FS where it is determined which ones will be the focus of the remedial alternatives presented. Compounds identified in the ROD are considered to be chemicals of concern (COCs).

These conclusions remain the same for the future land use scenario in which soil below the 0 to 2 ft. depth interval (or 0 to 4 ft. depth interval for utility worker) is brought to the surface in the course of site redevelopment, except for the lead hot spot analysis. A hot spot analysis identified three locations from Lot 64 (B-75 at 1 to 3 feet bgs of 8,690 mg/kg, B-74 at 3 to 4 feet bgs of 3,080 mg/kg, and B-70 at 5 to 7 feet bgs of 3,020 mg/kg, which are adjacent to Lot 63) that could affect the conclusions of the risk assessment for future outdoor worker and trespasser exposure to lead in soil from the subsurface that is brought to the surface during site redevelopment. Although prolonged exposure to these locations in isolation is not anticipated, they are retained for further evaluation in the FS.

Cumulative cancer risks are greater than the NCP risk range (10^{-4} to 10^{-6}), non-cancer HIs are greater than the protection goal of 1, and estimated blood lead levels exceed acceptable thresholds for hypothetical residential use. Risks associated with potable use of shallow and deep groundwater, if to occur in the future, are also unacceptable. Although groundwater is designated as Class IIA, potable use of shallow groundwater at the Site is unlikely since the Site and surrounding area are served by the City of Newark's potable water system, and the site-specific conductivity readings of the shallow groundwater indicate possible brackish conditions.

The findings of the SLERA identified the potential for unacceptable ecological risk; however, no additional ecological investigation is needed, provided that the proposed remedial alternatives will address the COPECs associated with HQs greater than 1 in surface soil, and that remediation goals that are protective of ecological receptors are used. Additional response actions will be evaluated for Lot 67 and Lot 69, where the SLERA identified unacceptable ecological risk with HQs greater than 1 in surface soil.

2.8 Reuse Assessment

The reuse assessment involved collecting and evaluating information to develop assumptions regarding the types or broad categories of reuse that might reasonably occur at a Superfund Site (e.g., residential, commercial/industrial, recreational, and ecological), so that cleanup standards and remedies can be tied to reasonably expected future land use. The findings of the reuse assessment indicated that both the current and reasonably anticipated future land use at the Site are consistent with industrial, non-residential uses.

2.9 Cultural Resource Survey

The findings of the Phase 1A Cultural Resource Survey (CRS; NV5, Inc., 2017) indicated that no archaeological resources that might meet the evaluation criteria for inclusion in the National Register are present within the Site. No further archaeological study is recommended.



2.10 Response Action Evaluations

Based on the risk assessments and ARAR compliance, response actions for those media posing unacceptable human health risks and/or risks to the environment will be evaluated in the FS. In addition, waste is a non-environmental media that will also be addressed in the FS as potential source material.

3. OBJECTIVES AND REQUIREMENTS OF SITE REMEDIATION

This section introduces the requirements and objectives that remedial actions are to achieve and the risk-based selection of target areas for remediation. In addition, concentrations of COPCs in soil and groundwater were compared to numeric ARARs, consisting of New Jersey Remediation Standards for soil and NJDEP GWQS and USEPA's Maximum Contaminant Levels (MCLs) for groundwater. These comparisons, which were performed as an additional evaluation in this FS, are provided in Section 3.4. RAOs specify how the cleanup will protect human health and the environment and serve as the basis for the development of remedial action alternatives. The process of identifying the RAOs follows the identification of affected media, contaminant characteristics, contaminant migration, exposure pathways, and receptor exposure limits. To achieve the RAOs, PRGs are developed as the benchmarks for the technology screening process and the assembly, screening, and detailed evaluation of alternatives.

3.1 Identification of Site-Related Contaminants

Several contaminants were identified as COPCs in the BHHRA and RIR. These COPCs pose unacceptable human health risks under current and/or future use scenario and are addressed in the FS and are listed below. Identification of other COPCs with respect to ARARs is provided in Section 3.4.

3.1.1 Soil

On select lots, RIR and BHHRA findings indicate that copper, lead, naphthalene, TCE, and xylenes are the site-related soil/fill COPC that pose unacceptable human health risks under current and/or future use scenarios. In the case of lead, which is a naturally occurring metal, the source of elevated concentrations is likely historic fill, which may also have been impacted by operations releases and illegal dumping. Allocation of lead concentrations to natural conditions, historic fill, or a release(s) was not an RI objective.

As listed in the BHHRA and shown on Figure 2-6, lead is a COPC that has unacceptable risks/hazards on Lots 1, 61, 62, 63, 64, 65, 68, and 70 and is carried through to the FS.

Copper concentrations at the Site did not exceed the ARAR (see Section 3.4). Copper associated with unacceptable human health (future visitor child) and ecological risk (Lot 63) is collocated with lead-impacted soil. Remedial action to address risks due to lead will also address human health risk and potential ecological risks due to copper.

3.1.2 Groundwater

As stated in the RIR, groundwater use is not reasonably expected in the future. However, hypothetical future potable use of groundwater is presented in the BHHRA for the purpose of ensuring that the FS includes a remedial action to prevent potable use.

3.1.3 Soil Vapor

Results of the BHHRA indicate that soil concentrations of naphthalene, TCE, and xylenes potentially present unacceptable risks to future indoor workers from potential soil gas intrusion (modelled from soil concentrations) on select lots (Lots 58, 62, and 68), should these currently vacant areas be subject to improvement via new buildings or occupation of existing vacant buildings.

3.1.4 Sewer Water

Concentrations of TCE, methylene chloride, benzo(a)pyrene, lead, and manganese were detected in water from an inactive sewer (Manhole 8) on Lot 1 at concentrations exceeding ARARs for groundwater (see Section 3.4). Sewer water is currently contained within Manhole 8 and was not quantitatively addressed by the BHHRA.

3.2 ARARs and TBCs

ARARs, to be considered (TBCs), and numeric PRGs are components of the RAOs. This section describes these terms and their implications for RAO and GRA development and subsequent alternatives analysis.

The national goal of remedy selection is to protect human health and the environment, to maintain that protection over time, and to minimize untreated waste (40 Code of Federal Regulations [CFR] Part 300.430 of the NCP (55 FR 8846)). In accordance with Section 121(d) of CERCLA, 42 U.S.C. § 9621, site remediation must comply with all applicable or relevant and appropriate laws, regulations, and standards promulgated by the federal government, except where waived. Substantive state environmental and facility siting requirements must also be attained, under Section 121(d)(2)(c) of CERCLA, 42 U.S.C. § 9621, if they are legally enforceable and consistently enforced statewide, and if the state ARAR is more stringent than the federal ARAR. If a state is authorized to implement a program in lieu of a federal agency, state laws arising out of that program provide the "applicable" standards. However, federal standards that are more stringent may be considered "relevant and appropriate." TBCs are guidance and policy documents, advisories, and other criteria that do not have the enforcement status of ARARs but support the development and evaluation of remedial alternatives. While TBCs are not promulgated or enforceable, TBCs may be consulted to interpret ARARs or to establish PRGs when ARARs do not exist for particular contaminants or do not sufficiently eliminate identified risks.

Section 121(e) of CERCLA, 42 U.S.C. § 9621, codified in the NCP at 40 CFR Part 300.400(e), exempts any response action conducted entirely on site from having to obtain federal, state, or local permits, where the action is carried out in compliance with Section 121. Remedial actions conducted on CERCLA sites need to comply only with the substantive aspects of ARARs and not with the corresponding administrative requirements.

As defined by the NCP, ARARs are placed into two classifications: applicable requirements and relevant and appropriate requirements. The two classifications are defined as follows:

- Applicable requirements are those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility siting laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstances at a CERCLA site. State standards that are more stringent than federal requirements may be applicable.
- Relevant and appropriate requirements are those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal or state environmental or facility siting laws that, while not applicable to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstances at a CERCLA site, address problems or situations sufficiently similar (relevant) to those encountered at the CERCLA site that their use is well suited (appropriate) to the particular site.

The term "relevant" was included so that a requirement initially screened as non-applicable because of jurisdictional restrictions could be reconsidered and, if appropriate, included as an ARAR for a given site. For example, MCLs would not be applicable, but are relevant and appropriate for a site with groundwater contamination in a potential (as opposed to an actual) drinking water source. A requirement may be either "applicable" or "relevant and appropriate," but not both. There are three categories of ARARs: chemical-specific, location-specific, and action-specific.

- Chemical-specific ARARs are numeric values that provide criteria for evaluating concentrations of specific hazardous contaminants and are developed based upon protection of human health and the environment. These values establish the acceptable amount or concentration of a chemical that may be found in or discharged to the environment. Chemical-specific ARARs provide a basis for the development of numerical

PRGs. For the purpose of this FS, chemical specific ARARs include New Jersey soil and groundwater standards (Table 3-1).

- Location-specific ARARs serve to protect individual characteristics, resources, and specific environmental features, such as wetlands, water bodies, floodplains, and sensitive ecosystems. Location-specific ARARs may affect or restrict remediation and appurtenant activities. The general types of location-specific requirements that may be applied to the Site include floodplain and waterfront development regulations.
- Action-specific ARARs are technology- or activity-based requirements of activities or processes, including storage, transportation, and disposal methods of hazardous substances as well as construction of facilities or treatment processes. Action-specific ARARs are defined by the components of a potential remedy and will be discussed as appropriate for each remedial alternative during detailed evaluation of alternatives.

The identification of ARARs began during the initial scoping of RAOs and GRAs and is completed during alternatives development. Table 3-1 lists ARARs for the Site by each of the three categories described above, while TBCs that are pertinent to the regulated substances, site location, and potential remedial actions are presented in Table 3-2. TBCs include non-promulgated criteria, advisories, guidance, screening levels, and proposed standards issued by Federal or State governments. TBCs are not potential ARARs because they are neither promulgated nor enforceable. As noted in the RIR, there are no ecologically sensitive habitat or significant cultural resources present at the Site, and ecological receptors are limited to urban wildlife; accordingly, location-specific ARARs and TBCs related to endangered species, wetlands, and historical preservation are not included in Tables 3-1 and 3-2.

TBCs include the Region 2 Clean & Green Policy to enhance environmental benefits by promoting technologies and practices that are sustainable. If practicable from schedule and technical viewpoints, redevelopment and property improvements could be coordinated with remediation to obtain green and sustainable synergies. The Clean & Green Policy is classified as an action-specific TBC.

3.3 Statutory Waivers for ARARs

CERCLA Section 121 (d) provides that under certain circumstances an ARAR may be waived. The six statutory waivers are as follows:

- **Interim Measure:** Occurs when the selected remedial action is only part of a total remedial action that will attain ARARs when completed.
- **Greater Risk to Health and the Environment:** Occurs when compliance with such requirements will result in greater risk to human health and the environment than noncompliance.
- **Technical Impracticability:** Occurs when compliance with such requirements is technically impracticable from an engineering perspective.
- **Equivalent Standard of Performance:** Occurs when the selected remedial action will provide a standard of performance equivalent to that required under the otherwise applicable standard, requirement, criteria, or limitation through use of another method or approach.
- **Inconsistent Application of State Requirements:** Occurs when a state requirement has been inconsistently applied in similar circumstances at other remedial actions within the state.
- **Fund-Balancing:** Occurs when, in case of an action undertaken using Superfund resources, the attainments of the ARAR would entail extremely high costs relative to the added degree of reduction of risk afforded by the standard such that remedial actions at other sites would be jeopardized.

3.4 Chemical-Specific ARAR Evaluation

This section addresses contaminants with respect to ARAR compliance to identify COPCs for further evaluation in the FS. Detected soil and groundwater constituents site-wide were elevated with respect to chemical specific ARARs. New Jersey Non-Residential Direct Contact Soil Remediation Standards (NRDCSRS) are soil ARARs (the two are used interchangeably below), and the lower values of NJDEP GWQS and MCLs are groundwater ARARs, used for the ARAR compliance evaluation.

Compliance determination was undertaken in accordance with NJDEP Technical Guidance for the Attainment of Remediation Standards and Site-Specific Criteria (September 24, 2012). Single-point compliance along with compliance averaging was employed to demonstrate if ARAR compliance was achieved for soil. For groundwater, single-point compliance was used to evaluate compliance with the ARAR. Results of ARAR compliance evaluations are provided as Tables 3-3 and 3-4 for soil and groundwater, respectively. Non-compliance results in the contaminant being designated for further evaluation in the FS.

3.4.1 Soil

Lead results were evaluated with respect to ARAR compliance (Table 3-3) by lot. Lots 1, 57, 58, 59, 60, 65, 66, 67, and 69 are in compliance with lead ARAR (800 mg/kg). ARAR compliance did not identify any new lots that were not listed as posing unacceptable human health risks under current and/or future use scenarios. Figure 3-1 displays site-wide shallow and subsurface lead results compared to the lead ARAR.

Lead soil sample results on lots with unacceptable risks due to lead based on BHHRA findings are shown on Figure 3-2 (Lots 1, 61, 63, 64), Figure 3-3 (Lot 65), Figure 3-4 (Lot 68) and Figure 3-5 (Lot 70).

Benzene in 1 of 20 surface soil samples and 2 of 5 subsurface soil samples from Lot 64 (Figure 3-6) exceeded its NRDCSRS (5 mg/kg). Following NJDEP compliance guidance and as shown in Table 3-1, the data do not demonstrate ARAR compliance for benzene. While these Lot 64 benzene results were identified in the BHHRA as statistical outliers, benzene is identified as a COPC on Lot 64.

Vinyl chloride concentration in one of six subsurface soil samples from Lot 68 exceeded the NRDCSRS. This sample was identified in the BHHRA as a statistical outlier. As shown in Table 3-3, the results demonstrate ARAR compliance for vinyl chloride. Vinyl chloride is not a site COPC warranting remedial action.

Benzo(b)fluoranthene, benzo(a)anthracene, and dibenz(a,h)anthracene were detected in select soil/fill samples at concentrations exceeding NJDEP NRDCSRS. However, as presented in Table 3-3, the compliance point concentrations of these PAHs meet their respective ARARs following NJDEP comparison protocols. Accordingly, they are not identified as COPCs carried through the FS.

Benzo(a)pyrene concentrations at select locations were not in compliance with ARARs on Lot 57 (subsurface soil), Lot 61 (surface soil), Lot 62 (surface soil), Lot 63 (subsurface soil), Lot 65 (surface soil), Lot 66 (subsurface soil), and Lot 67 (surface soil). Figures 3-7 through 3-11 show benzo(a)pyrene concentrations on these lots. However, benzo(a)pyrene detections, as documented by their average and 95% upper confidence level (UCL) values, are consistent with typical urban soil concentrations. As shown in Table 3-3, these values were slightly over the ARAR (2 mg/kg). Based on this information, benzo(a)pyrene is not a COPC to be carried through to the FS due to ARARs. Benzo(a)pyrene along with other PAHs are carried through to the FS in the context of total PAH concentrations for ecological receptors.

Arsenic was detected in 9 of 21 soil samples from five lots at concentrations exceeding the ARAR (19 mg/kg), including a parent/duplicate sample pair from Lot 61. As shown in Table 3-3, ARAR compliance is met for arsenic with the exception of surface soil at Lot 61 and subsurface soil at Lot 63 and Lot 67. The highest arsenic concentrations are

collocated at Lot 63 with lead concentrations of more than 1,600 mg/kg. Remedial actions for lead on Lot 63 will address arsenic. The arsenic concentration in a surface soil sample from one of four locations at Lot 61 (parent/duplicate sample pair) exceeded the ARAR, and is not collocated with a corresponding lead ARAR exceedance. This sample (B-61) was identified in the BHHRA as a statistical outlier and was collected below a shallow surface soil sample with an arsenic concentration below the ARAR. Because the arsenic concentration in just one sample from Lot 61 exceeded the ARAR, and did not exceed the ARAR in the other three subsurface soil samples from this lot (Soil Borings B-25 through B-27), arsenic at Lot 61 is not identified as a COPC. Likewise, because arsenic did not exceed the NJDEP NRDCSRS in surface soil samples from Lot 67, and only slightly exceeded the ARAR (19.8 mg/kg versus 19 mg/kg) in one subsurface soil sample, arsenic is not attributed to a site release. Arsenic is not an ecological risk driver (not a COPEC in SLERA) and is not identified as a COPC requiring further consideration in the FS.

Manganese was detected in one surface soil sample from one lot (Lot 64) at a concentration exceeding the NJDEP NRDCSRS. As shown in Table 3-3, NJDEP compliance requirements are met for manganese, and manganese is not a site COPC.

PCBs were detected in exceedance of ARAR (1 mg/kg) in surface soil samples from five lots (Lots 57, 64, 65, 67, and 70) and two subsurface soil samples at one lot (Lot 70). As shown in Table 3-3, ARAR compliance is met for PCBs at Lots 57, 64, 65 and 67. ARAR compliance is not met for subsurface soil at Lot 70 (PCB Aroclor 1260). Figure 3-12 shows Lot 70 PCB results. The ARAR exceedance is collocated with a lead concentration of 2,880 mg/kg. The Lot 70 soil is under an NJDEP-approved engineering control asphalt surface barrier and deed notice. PCB Aroclor 1260 on Lot 70 is considered a COPC and is subject to evaluation in the FS.

3.4.2 Groundwater

Concentrations of VOCs, SVOCs, and metals detected in groundwater were compared to ARARs. The ARAR was the lower of NJDEP GWQS and USEPA MCL. Table 3-4 summarizes ARAR exceedances in groundwater. As noted previously, site groundwater is not used for potable purposes, nor is it anticipated to be used as such in the future. These ARAR comparisons were, therefore, performed to assist in evaluating potential response actions to meet RAOs.

Shallow Fill Unit

Groundwater beneath the Site is subject to tidal influences. This influence results in groundwater with elevated conductivity values and elevated concentrations of sodium and other salts as reported in the RIR, which are indicative of saltwater intrusion.

ARAR exceedances for metals include iron, sodium, aluminum, barium, arsenic, and manganese. Some of the exceedances are site-wide (e.g., iron, manganese, and sodium), while others (aluminum) are more localized to a few lots. Because the shallow fill unit wells are screened in fill containing these metals that were not identified as soil COPC, these chemicals are not identified as groundwater COPCs. Detections of PCBs, mercury, chromium, and zinc in groundwater do not exceed ARARs.

While not as widespread as exceedances of iron, manganese, or sodium, lead concentrations in groundwater from the shallow fill unit exceed the ARAR in three site areas, as shown on Figure 3-13. Lead concentrations exceeding ARAR are generally confined to the eastern half of the Site (Figure 3-13). Lead is identified as a Site COPC in groundwater.

Of organic ARAR exceedances, groundwater in the shallow fill unit with 1,4-dioxane concentrations exceeding the respective ARAR is the most widespread and is generally found on the eastern half of the Site (Figure 3-14). 1,4-Dioxane concentrations in the shallow fill unit generally show a decreasing trend from March 2018 to February 2019. In February 2019, fewer shallow fill wells had 1,4-dioxane ARAR exceedances than the earlier sampling events.

Shallow fill groundwater ARAR exceedances for other chemicals are shown on the following figures:

Figure 3-15: Acetone Groundwater Sampling Results - Fill Unit
Figure 3-16: 1,1,2-TCA Groundwater Sampling Results - Fill Unit
Figure 3-17: 1,1,2,2-TCA Groundwater Sampling Results - Fill Unit
Figure 3-18: Arsenic Groundwater Sampling Results - Fill Unit
Figure 3-19: Benzene Groundwater Sampling Results - Fill Unit
Figure 3-20: Benzo(a)pyrene Groundwater Sampling Results - Fill Unit
Figure 3-21: Ethyl Benzene Groundwater Sampling Results - Fill Unit
Figure 3-22: p-cresol Groundwater Sampling Results - Fill Unit
Figure 3-23: Selenium Groundwater Sampling Results - Fill Unit
Figure 3-24: TCE Groundwater Sampling Results - Fill Unit
Figure 3-25: Toluene Groundwater Sampling Results - Fill Unit
Figure 3-26: Vinyl Chloride Groundwater Sampling Results - Fill Unit
Figure 3-27: Xylenes Groundwater Sampling Results - Fill Unit

The majority of the shallow fill groundwater ARAR exceedances for organic COPC were in four areas:

- Lot 57: The primary VOC above its ARAR is acetone in MW-118 (shallow fill unit). Figure 3-15 displays acetone groundwater concentrations. Other VOCs were not reported above ARARs. While lead concentrations in MW-118 have decreased by a factor of 40, groundwater with acetone exceeding the ARAR is collocated with groundwater with lead exceeding its respective ARAR. p-Cresol (Figure 3-22) shows increasing concentrations over time in samples from MW-118 (Figure 3-22) and has consistently exceeded its ARAR. In addition to p-cresol, there are several low level SVOCs (benzo(a)anthracene [0.3 µg/L], pentachlorophenol [1.9 µg/L]) detected in MW-118 samples at concentrations exceeding ARARs with less consistency.
- Lot 58: The primary ARAR exceedances are in a well (MW-124) that was sampled once. 1,1,2-Trichloroethane (Figure 3-16), toluene (Figure 3-25), ethyl benzene (Figure 3-21), and xylenes (Figure 3-27) are the VOC COPCs. SVOCs, benzo(a)anthracene and benzo(b)fluoranthene, were reported at low concentrations (less than 0.3 µg/L) exceeding ARARs collocated with VOC COPCs in Well MW-124.
- Lots 60/62: The primary VOC and SVOC exceedances in the area between Buildings #1 and #6 are 1,1,1-TCA and 1,4-dioxane, respectively.
- Lots 63/64: The only two VOCs on Lot 63 with ARAR exceedances are benzene (Figure 3-19) and 1,1,2-TCA (Figure 3-16). These two VOCs also exceed ARARs on Lot 64 but Lot 64 has additional ARAR exceedances including other chlorinated VOCs, xylenes, and ethyl benzene. The Lot 64 shallow fill unit well with the highest VOCs is Monitoring Well MW-106 near the USTs. This well has shown decreases in less than a year (March 2018 - February 2019) of many VOC concentrations including PCE, TCE, and xylenes that no longer exceed ARARs (Table 3-2). 1,4-Dioxane is the primary SVOC on Lot 64 exceeding its ARAR (0.4 µg/L). Like other VOCs, the 1,4-dioxane concentration has decreased (approximately by a factor of 30) in MW-106 during the RI. 1,4-Dioxane concentrations in other Lot 64 wells have decreased but the decrease may be within analytical variability. Groundwater at Lots 63/64 with ARAR exceedances for VOC and SVOC is collocated with lead ARAR exceedances. Well E-3 is the only well on Lots 63/64 with lead concentrations consistently below the ARAR.

Generally, shallow fill groundwater arsenic concentrations exceed its ARAR (3 µg/L) site-wide. Arsenic concentration generally decreased between March 2018 and February 2019. The February 2019 concentrations typically are 2 to 10 µg/L. The results do not indicate a "hot spot area" identifying a source or a contaminant plume. The highest arsenic



concentration was at MW-106 (38.6 µg/L, March 2018). Nearby arsenic concentrations including upgradient locations are less than 10 µg/L and similar to other site-wide results. Arsenic concentration in MW-106 decreased by 70 percent to 11.9 µg/L 11 months later (February 2019). The shallow fill wells are screened in the soil/fill documented to contain arsenic. Arsenic was not identified as a COPC in soil. This finding, in combination with consistent site-wide arsenic concentrations and no source area present, results in arsenic in shallow fill groundwater not being a site COPC and not carried through the FS.

Arsenic concentrations in the deep unit groundwater are higher than the shallow fill unit in three wells. Because the lack of a shallow fill unit source, the deep groundwater arsenic is related to the native soil that the wells monitor and is not site-related.

There are no groundwater VOC exceedances on Lots 1, 65, 66, 67, 68 and 70. There are other chemicals in groundwater above NJDEP GWQS or MCL. However, because they are random, sporadic, and/or at low concentrations, they are not identified as COPC and are not carried through the FS.

Deep Unit

In the deep unit, 1,1,2-TCA (Figure 3-28), PCE (Figure 3-29), benzo(a)anthracene (Figure 3-28), 1,1,2,2-tetrachloroethane (Figure 3-29), benzene (Figure 3-30) and 1,4-dioxane (Figure 3-30) exceeded ARARs. The deep groundwater was only sampled once in the RI. The deep unit exceedances were at lower concentrations than the shallow fill unit. Metals above ARARs were the fill-related metals described above (aluminum, iron, arsenic, manganese, and sodium). Lead was not detected above its ARAR (5 µg/L) in the deep unit (Figure 3-30).

Because exceedances in the deep unit are random, sporadic, and/or at low concentrations, deep unit groundwater is not identified as a medium to be carried through the FS.

3.5 Identification of Contaminated Media

Based on the results of the RI, BHHRA, and SLERA, as well as the comparisons to ARARs performed in the previous section, risks to human health, welfare, and the environment posed by the identified COPCs in waste, soil/fill, soil gas, groundwater, and sewer water may warrant the need for remedial action.

3.5.1 Waste

As discussed in the RIR, "waste" includes containerized waste, LNAPL in USTs and Building #15A, and solids in Manhole 8, and only acts as a potential source material if released into the environment. Manhole 8 solids are addressed in conjunction with sewer water (Section 3.5.5). Waste will be addressed by remedial alternatives.

Based on results for water in Building #15 and the contents in the active sewer system, neither is classified as a potential source material or principal threat waste. Sumps in Building #17 and former Building #4 collect precipitation. Based on the RI results and the source of water in sumps, the sump contents are not carried through the FS. Building #2 sump is an active water control measure for the Buildings #2 and #3 basements which are occupied. Because the sump water is pumped into a pipe connected to the Passaic Valley Sewer Commission (PVSC) system, this sump is not carried through the FS.

3.5.2 Soil/Fill

Soil in select areas contain site COPCs in surface and subsurface soil/fill that exceed ARARs (Section 3.4.1) and/or pose unacceptable risks per the BHHRA or SLERA (Section 3.1.1). Soil/Fill in these areas is a contaminated medium to be carried through the FS. Some site contaminants, including metals and PAHs, are commonly found in historic fill and urban soil and are not COPCs, including iron, sodium, aluminum, barium, arsenic, and manganese. PRGs are



developed for soil/fill COPCs to ensure that remedial alternatives are protective of human health and the environment and comply with CERCLA requirements (Section 3.7.2).

Lot 64 soil where LNAPL (residual petroleum waste) was observed is a contaminated medium to be carried through the FS. Per RAOs (Section 3.6), the potential off-site movement of soil/fill is a pathway to be carried through the FS.

Surface soil due to potential ecological risk on Lots 67 and 69 is a medium to be addressed in the FS.

3.5.3 Groundwater

As stated in the RIR, groundwater use is not reasonably expected in the future. However, hypothetical future potable use of groundwater is presented in the BHHRA for the purpose of ensuring that the FS includes a remedial action to prevent potable use.

As presented in Section 3.4.2, groundwater contains COPC above ARARs and thus groundwater is a medium to be carried through the FS.

3.5.4 Soil Gas

Soil associated with COPCs presenting unacceptable risks due to potential indoor vapor intrusion for future indoor workers on Lots 58, 62, and 68 is addressed in the FS. The NJDEP Vapor Intrusion Technical Guidance (VIT), found at <https://www.state.nj.us/dep/srp/guidance/vaporintrusion/> is a TBC for soil gas.

3.5.5 Sewer Water

The Manhole 8 sewer water along with solids (Section 3.5.1) are media carried through the FS. The Lot 57 sewer wall pipe and shallow groundwater (MW-118) contained COPCs (acetone) above ARAR. As required by USEPA, the remediation of Lot 57 will be conducted under NJDEP via a Licensed Site Remediation Professional (LSRP) outside of the FS. The NJDEP assigned case number via the NJDEP Hotline is 20-04-05-0923-04.

The remediation activities will be conducted by the person responsible for remediation (Lot 57 owner/operator). LSRP is to communicate and work with USEPA on Lot 57 remedial action. USEPA through NJDEP is to approve of any work.

3.6 Remedial Action Objectives and General Response Actions

Medium-specific RAOs have been developed to mitigate potential site-related health risks, and corresponding GRAs have been identified that could potentially satisfy the RAOs. The medium-specific RAOs focus on the specific areas and regulated substances to which exceedances of USEPA's target risk criteria are attributed.

In accordance with CERCLA guidance (Land Use in the CERCLA Remedy Selection Process, Office of Solid Waste and Emergency Response (OSWER) Directive No. 9355.7-04), RAOs and remedial alternatives should be developed to achieve cleanup levels that are consistent with the reasonable anticipated future land use over as much of the Site as possible. Because the Site is located within a dedicated industrial zone where residential use is prohibited and current owners and operators have expressed no intent in changing use, land use is expected to remain non-residential for the foreseeable future. Accordingly, RAOs and GRAs have been drafted using the results of the RIR, BHHRA and SLERA to address those media posing risk to human health, welfare, or the environment that are consistent with anticipated future site use for non-residential purposes. It is assumed that a deed recording prohibiting such residential use will be implemented.

Results of the SLERA indicate that risks to ecological site receptors that exceed screening thresholds will be addressed via remedial actions designed to protect risks to human health. Additionally, there are two lots (67 and 69) that will

require consideration of remedial actions to address risks specific to ecological receptors from surface soil. RAOs and GRAs for each medium of interest are summarized below.

REMEDIAL ACTION OBJECTIVES AND GENERAL RESPONSE ACTIONS

Media of Interest	RAO	GRA
Wastes	Secure or remove wastes to the extent practicable to prevent human and ecological exposures.	No Action
	Prevent uncontrolled movement of wastes (i.e., spills and free-phase liquid) to environmental media.	Removal
	Minimize or eliminate human and ecological exposure to waste materials.	Disposal
Soil/Fill	Remove or minimize COPC concentrations and eliminate human exposure pathways to COPCs in soil and fill material.	No action
	Remove or minimize COPEC concentrations and eliminate or minimize ecological exposure pathways to COPECs in surface soil and surface fill material.	Institutional controls/ access restrictions
	Prevent or minimize offsite transport of soil containing COPCs to minimize the potential for interaction between the Site and the Passaic River.	Engineering controls
	Prevent or minimize potential for leaching of COPCs to groundwater and surface water from soil and fill.	Treatment
Groundwater	Minimize contaminant concentrations and restore groundwater quality.	Removal
	Prevent exposure to COPCs in groundwater.	Treatment
	Prevent or minimize migration of groundwater containing COPCs.	MNA
	Prevent or minimize discharge of groundwater containing COPCs to surface water to minimize the potential for interaction between the Site and the Passaic River.	Disposal

Media of Interest	RAO	GRA
Soil Gas	Minimize contaminant levels in sources of COPCs in soil gas that may migrate to indoor air of overlying buildings.	No action Institutional controls Engineering controls (soil gas/vapor barrier) Removal Treatment (if necessary)
Sewer Water	Prevent exposure to COPCs in sewer water and solids associated with a release from the inactive sewer system.	No action Removal
	Minimize concentrations of COPCs in sewer water (inactive system).	Disposal
	Prevent or minimize discharge of sewer water COPCs to surface water to minimize the potential for interaction between the Site and the Passaic River.	

3.7 Preliminary Remediation Goals

PRGs are chemical-specific, quantitative goals for each medium and/or exposure route that are intended to be protective of human health and the environment and meet RAOs. PRGs were developed based on ARARs and risk-based levels (human health and ecological), with consideration of current and reasonably anticipated future use, background concentrations, analytical detection limits, guidance values, and other available information to aid in defining the extent of contaminated media and enable remedial action cost estimation.

3.7.1 Preliminary Remediation Goals for Waste

The PRG for wastes remaining on Site will be addressed through removal followed by reduction of toxicity, mobility, or volume (TMV). If wastes are determined to be characteristically hazardous, the Resource Conservation and Recovery Act (RCRA) Land Disposal Restriction (LDR) will be an ARAR.

3.7.2 Preliminary Remediation Goals for Soil/Fill

As described in the BHHRA and RIR, the COPC, receptors and media with unacceptable risks are as follows:

Receptor	COPC	Medium	Exposure Routes
Child visitor	Lead, copper	Soil	Dermal contact, incidental ingestion, dust inhalation
Trespasser	Lead	Soil	Dermal contact, incidental ingestion, dust inhalation
Construction worker	Lead	Soil	Dermal contact, incidental ingestion, dust inhalation
Utility worker	Lead	Soil	Dermal contact, incidental ingestion, dust inhalation

Receptor	COPC	Medium	Exposure Routes
Outdoor worker	Lead	Soil	Dermal contact, incidental ingestion, dust inhalation
Indoor worker	Lead	Soil	Dermal contact, incidental ingestion, dust inhalation
	TCE, xylenes, naphthalene	Soil	Inhalation of indoor air (vapor intrusion)

Soil/Fill PRGs were developed for soil with consideration of these risk drivers and then used to identify areas of the Site requiring remedial actions and to support estimations of areas and/or volumes of impacted media. The general PRG selection process is based on USEPA (1991b) guidance and is as follows:

1. Calculate human health risk-based concentration (RBC) for each risk driver/receptor scenario identified in the risk assessment, for both cancer and non-cancer-based effects, as applicable. The lower value between the non-cancer and cancer-based RBC is set as the "final" RBC.
2. Identify any numeric ARARs or values TBCs.
3. Identify a background concentration, if available. PRGs should not be set at a level that is lower than expected background concentrations.
4. Identify a laboratory reporting limit deemed reasonably achievable for the constituent and medium in question; PRGs should not be set at a level that is technically unachievable in the laboratory.

RBCs, ARARs/TBCs, laboratory limits and background concentrations are then all considered in conjunction with other site-specific information when selecting the PRG. Each component of this process is described in further detail below.

Step 1: Calculation of the RBCs

Direct contact with soil: copper and lead

Copper

A non-cancer soil RBC for copper, based on direct contact exposure routes, was developed for the child visitor scenario. Because no cancer-based toxicity values are available for copper (which is classified by USEPA as Class D, not classifiable as to human carcinogenicity, USEPA, 2020), a cancer-based RBC was not calculated.

The non-cancer RBC was derived based on the exposure assumptions and toxicity values specified in the BHHRA. The soil RBC accounts for multiple exposure routes, including incidental ingestion of and dermal contact with copper in soil, and inhalation of copper entrained on fugitive dust particles. However, because USEPA currently does not provide a dermal absorption fraction (ABS_d) in soil and no inhalation reference concentration (RfC) was identified for copper, complete information is not available to calculate RBCs for either the dermal contact or dust inhalation route, an RBC was calculated for only the incidental ingestion route of exposure. Thus, the soil RBC for copper is based only on incidental ingestion. The copper RBC is based on a target HI of one, in accordance with USEPA guidance (USEPA, 1991).

Table 3-5 presents the equations and input parameters for the child visitor scenario, for which a soil direct contact RBC of 526 mg/kg was derived.

Lead

Health risks associated with exposure to lead in soil are evaluated using an approach different from that of other types of contaminants. For lead, biokinetic uptake models are used to estimate a theoretical probability that the blood lead level (BLL) will exceed a target BLL. Lead risks were evaluated in the human health risk assessment for all exposure scenarios. Lead risks for young children (6 and under, such as the child visitor) were evaluated using the USEPA Integrated Exposure Uptake Biokinetic Model (IEUBK), whereas older receptors were evaluated using the Adult Lead Methodology (ALM).

The IEUBK model is applicable for the child visitor scenario. The human health risk assessment indicated that, using the IEUBK: "the USEPA Region 2 soil screening level of 200 mg/kg based on evaluation of the 12 to 72-month age range [USEPA, 2017] corresponds to a blood lead distribution that does not exceed 5 µg/dL for 5% of the population" (BHHRA; Section 4.5.4). However, this soil concentration represents the entire daily dose of soil at a residence. The BHHRA noted various uncertainties that could potentially over- or underestimate health risks associated with the child visitor scenario (see Section 6.3.3 of BHHRA), which is an unlikely scenario given that the Site is an industrial property. Note that the child visitor RBC of 200 mg/kg is equal to the USEPA Region 2 residential screening value for lead. As noted, future residential use of the Site is not planned and is not considered in development of cleanup objectives.

The BHHRA assumed that 1/7th of the daily dose of soil would occur at the Site, while the remainder (6/7th) of the home exposure would occur at an average lead soil levels for urban piedmont in New Jersey of 139 mg/kg (BHHRA Section 4.5.6). Adjusting the 200 mg/kg soil screening value for time spent at the Site results in a lead RBC for the child visitor of 567 mg/kg¹. Therefore, an RBC of 567 mg/kg was selected as the child visitor RBC for lead.

The lead RBCs for other receptor scenarios, including the indoor worker, outdoor worker, utility worker and construction worker, were derived using the ALM. (According to the BHHRA, the adolescent trespasser lead exposure was qualitatively assessed using the outdoor worker scenario; therefore, the outdoor worker RBC is assumed protective of the adolescent trespasser.) All input parameters for the ALM for each scenario are the same as those used in the BHHRA and include both USEPA default values and site-specific values. Tables 3-6 through 3-9 provide the ALM input values and calculation of RBCs.

Soil RBCs protective of direct contact exposures for lead are summarized below.

Receptor	Lead Soil RBC – direct contact (mg/kg)
Child Visitor	567
Indoor Worker	1,050
Outdoor Worker	784
Utility Worker	3,292
Construction Worker	441

Vapor intrusion of VOCs via subsurface soil

Cancer risk exceeding the upper end of the USEPA cancer risk range and/or a non-cancer HI exceeding one was identified for an indoor worker exposed to TCE, naphthalene and total xylenes via vapor intrusion of VOCs from soil.

¹ Verification of lead visitor cleanup number is as follows:

$(6/7 * 139 \text{ mg/kg [background level]}) + (1/7 * 567 \text{ [site RBC] mg/kg}) = 200 \text{ mg/kg (IEUBK-based cleanup number)}$.

Both non-cancer and cancer risk-based soil RBCs were thus developed for these three constituents. The cancer-based RBC is based on a target cancer risk of one in one million (1E-06), which is the lower end of the USEPA target range for cancer risk. The non-cancer-based RBC is based on a HI of one.

To calculate a soil RBC protective of the vapor intrusion pathway, a target indoor air concentration was first derived. This indoor air concentration (IA) was calculated using the equations and input parameters provided in Table 3-10. Exposure assumptions and toxicity values used in the derivation of this indoor air concentration are the same as those used in the BHHRA for the indoor worker scenario (Ramboll, 2020).

This target indoor air concentration was then divided by an attenuation factor, alpha (α), which accounts for the attenuation of VOCs between subsurface soil gas and indoor air of a theoretical building. Alpha values for the COPCs were obtained from the BHHRA (BHHRA, Appendix D). The resulting quotient (IA / α) is the target soil gas concentration (Csg). The soil RBC was then back-calculated from Csg using chemical-specific characteristics (Henry's Law soil and organic carbon-water partition coefficients) in conjunction with soil characteristics specific to sand (organic carbon content, effective air-filled and water-filled porosity and bulk density values) and chemical characteristics. Equations and input values for calculation of IA, Csg and RBC are provided in Table 3-10.

The lowest value between the cancer-based RBC and the non-cancer-based RBC was selected as the final soil RBC protective of the vapor intrusion pathway. The resulting soil RBCs for volatile COPCs are summarized below.

COPC	RBC – vapor intrusion (mg/kg)
TCE	0.02
Total Xylenes	6.5
Naphthalene	0.62

These RBCs were calculated using attenuation factors for soil vapor intrusion (see Appendix D of the BHHRA) assuming an infinite source and are applicable for the determination of appropriate institutional controls (e.g., vapor barriers or vapor mitigation systems). The soil vapor intrusion evaluation in the BHHRA included a mass balance check that is not incorporated into these RBCs. If the selected remedy is source reduction or soil vapor extraction, the RBCs should be re-evaluated to include the mass balance analysis, because assuming an infinite source for highly volatile chemicals overestimates soil vapor intrusion cancer risk and non-cancer hazard.

Step 2: Identification of ARARs/TBCs

The Site is an industrial property and is zoned for non-residential use. Future residential use is not expected to occur, and existing and additional land use restrictions will continue industrial or commercial uses of the Site and prohibit redevelopment for residential use². In light of this, Step 2 of the PRG evaluation focused on non-residential ARARs.

ARARs applicable to non-residential use of soil include the NJDEP non-residential direct contact soil remediation standards (New Jersey Administrative Code [N.J.A.C.] 7:26D-4.3, non-residential direct contact soil remediation standards). These standards are summarized below.

² As noted before, it is also assumed that potable use of the brackish site groundwater will be prohibited through use of an institutional control.

COPC	NJDEP Non-residential Soil Remediation Standard (mg/kg)
Copper	45,000
Lead	800
TCE	10
Total Xylenes	170,000
Naphthalene	17

New Jersey impact to groundwater values are TBCs based on reasonably anticipated future use.

Step 3: Identification of Background Concentrations

Site-specific background concentrations are not available. The background concentrations for volatile organic COPCs (TCE, xylenes) are expected to be non-detect. While naphthalene could be attributed to off-site anthropogenic sources (such as fuel emissions), it was assumed that the background concentration for this COPC is non-detect absent any data specific to the Site.

Both copper and lead may be present in soil due to natural underlying geochemistry and/or non-point anthropogenic sources such as cinders, ash and fill materials. Because the soil/fill is non-native material placed at the Site over a 20-year period, there is likely more than one soil/fill source. As described in the RIR, the fill is classified as historical fill in accordance with NJDEP regulations. Allocation of impacts due to natural conditions, pre-placement of contaminated fill, or a release(s) was not an RI objective. Due to these factors, background concentrations for lead and copper were not considered further in the development of PRGs.

Step 4: Identification of Laboratory Reporting Limits

RBCs and ARARs for copper and lead are at levels reasonably expected to be achieved via laboratory analysis. The ranges of laboratory reporting limits for other COPCs, as reported in the BHHRA (Table 2.01 of Appendix A) are as follows:

COPC	Range of Laboratory Reporting Limits (mg/kg)
Copper	(all detected)
Lead	(all detected)
TCE	0.00027 – 0.081
Total Xylenes	0.00057 – 0.00092
Naphthalene	0.011 – 0.056

The reporting limits achievable for site soils are lower than any of the RBCs or ARARs identified in Steps 1-2 above. Therefore, laboratory reporting limits were not considered further in development of PRGs.

Selection of Final PRGs

Based on consideration of criteria described in Steps 1-4 above, PRGs were identified for each COPC.

For lead, RBCs range from 441 mg/kg to 3,292 mg/kg, based on the ALM for adult receptors and the IEUBK for the child visitor receptor; the ARAR for lead is 800 mg/kg. Of these considered values, the ARAR of 800 mg/kg is selected as the PRG for lead. This concentration is similar to the RBC for the outdoor worker and adequately protective of both the indoor worker and utility worker receptors. While lower RBCs were derived for the child visitor and construction worker scenarios, these values were not selected as PRGs because: 1) the child visitor scenario is a highly unlikely

scenario for an industrial property that is now and likely in the future to be largely paved/covered and because the higher intensity soil exposures assumed for this young receptor are unlikely to occur if accompanied by an adult; and 2) while a construction worker scenario is plausible considering the potential for redevelopment of the Site, exposures to lead during any future excavation work can be managed appropriately with institutional controls that mandate both a soil management plan and health and safety plan for workers that would include specifications for personal protective equipment.

For copper, the RBC of 526 mg/kg is substantially lower than the ARAR of 45,000 mg/kg. As discussed, the child visitor scenario, which included high intensity outdoor soil exposures, is highly unlikely to occur at the Site. The BHHRA identified a HI greater than one for the child visitor scenario at only Lot 63; it is noted that the exposure point concentration (EPC) for copper at this lot is driven primarily by one sample location (B-33), which is also collocated with an elevated lead concentration that exceeds the lead PRG, and thus is already being addressed in the FS. However, use of the ARAR as a cleanup objective may not be adequately protective of other non-residential receptors if basing health risk off of the oral reference dose used in the BHHRA, given the 40-fold difference in toxicity values between those that form the basis of the ARAR (0.04 mg/kg/day) and the RBC (0.001 mg/kg/day). Thus, the RBC of 526 mg/kg is conservatively selected as the PRG for copper.

The RBCs for TCE, total xylenes and naphthalene are based on the vapor intrusion pathway, whereas the ARARs are based on the direct contact pathway. The BHHRA did not indicate unacceptable cancer risk/hazards for these COPCs based on direct contact. Because the ARARs would not be protective of the vapor intrusion pathway, the RBCs for TCE, total xylenes and naphthalene are selected as the PRGs. The FS will evaluate potential response actions for the vapor intrusion related PRGs, including consideration of requirements for vapor barriers/sub slab depressurization systems and/or building design to mitigate the potential vapor intrusion pathway.

Lots 67 and 69, located at the southern and northern ends respectively of the Site, both have one or more shallow soil samples with concentrations of select COPECs exceeding ecological screening criteria but neither lot has concentrations that exceed either ARARs or human-health risk-based values. Remedial decisions for these areas are thus focused solely on ecological receptors hypothetically present in either the developed portion of these lots or adjacent ecological habitat, which typically consists of vegetated margins around paved areas. These areas, like others in the site-wide SLERA, were evaluated by comparing shallow sample results to screening values for birds, mammals, plants, and soil invertebrates, where available. Constituents exceeding screening values consisted primarily of PAHs and some metals.

For PAHs, the lowest of available ecological screening value (ESV), 1.1 mg/kg of total high-molecular-weight PAHs based on the protection of small mammals, was used to evaluate soils data from samples collected both within the vegetated areas (designated as "ecological habitat") and adjacent to these areas. However, this PAH value is unrepresentative of actual risks from PAHs at the Site. The mammal ESV is an USEPA ecological soil screening level based solely on the toxicity of benzo(a)pyrene, considered the most toxic of the PAHs; however, Lot 67 and Lot 69 samples contain a greater proportion of less toxic high- and low-molecular weight PAHs. In addition, the unusually low ESV of 1.1 mg/kg is below the average concentration of total PAHs (1.8 mg/kg) detected in NJDEP surface soil sampling of relatively unperturbed areas in Newark and elsewhere in Essex County (NJDEP, 2020; Appendix 3). The potential site-related risk from PAHs at Lots 67 and 69 is thus likely to be less than suggested by the use of the ESV.

Regardless of the screening levels, the potential ecological risk from these lots is reduced due to the low value of the habitat generally, particularly for wildlife receptors. A review of the environment represented by samples identified as collected from "ecological habitat" (B-53 in Lot 67 and B-63 and DF-7 in Lot 69) indicates that these areas are comprised of vegetation around the edges of pavement or other developed parts of the lots. Vegetated areas are small and highly fragmented, separated by open areas of pavement where small mammals would be exposed to predation by raptors and other predators. Vegetation consists largely of invasive species, which typically provide less suitable forage material for herbivores, and the small size of the areas would provide a limit prey base for invertebrate-eating carnivores

such as the robin or shrew. For these reasons, Lot 67 and Lot 69 areas are unlikely to provide the habitat necessary for a sustaining population of small mammals or birds, though both may forage in the area at times.

Nonetheless, both Lots 67 and 69 will be considered for remediation with the objective of reducing the exposure of ecological receptors in shallow soil to constituent concentrations above the ecological screening values. No further risk assessment is proposed.

COPCs or COPECs that have unacceptable risks/hazards and/or exceed ARARs are identified as COCs that are carried through to the FS and will be the focus of the remedial alternatives presented. PRGs for COC associated with unacceptable risks listed in the RIR and BHHRA are summarized in the table below:

Chemical of Concern	Selected PRG (mg/kg)	Basis of PRG
Lead	800	ARAR/ALM-outdoor worker
Copper	526	Non-cancer - child visitor
TCE	0.02	Cancer - vapor intrusion, worker
Total Xylenes	6.5	Non-cancer - vapor intrusion, worker
Naphthalene	0.62	Non-cancer - vapor intrusion, worker

For soil COPCs associated with ARAR non-compliance (Section 3.4.1), the PRGs are the NJDEP NRDCSRS:

- PCB - 1 mg/kg
- Lead - 800 mg/kg
- Benzene - 5 mg/kg

Lead, copper, TCE, xylene, naphthalene, PCB and benzene are soil COCs to be addressed by remedial alternatives in the FS.

3.7.3 Preliminary Remediation Goals for Groundwater

Groundwater is not currently used as a source of potable water, and future groundwater use at the Site is unlikely because site-specific conductivity readings of the shallow groundwater indicate brackish conditions due to tidal influence of the adjacent Passaic River. Additionally, the Site and surrounding area are served by the City of Newark's potable water system. Potable use of groundwater should be avoided to prevent potential mobilization of the soluble fraction of COPCs in fill that has been identified at the Site.

For drinking water use, NJDEP GWQS are chemical-specific ARARs. Federal and NJDEP drinking water standards are also relevant and appropriate requirements. For site-related contaminants, NJDEP GWQS are the most stringent promulgated standards and were used as the PRGs.

Groundwater in some wells contains contamination above ARARs (Section 3.4.2). Site-related COC that exceed ARARs as described in Section 3.4.2 are identified as COC that are carried through to the FS and will be the focus of the remedial alternatives. The groundwater COC and the respective PRGs are as follows:

VOCs	PRG (µg/L)
Acetone	6,000
Benzene	1
Ethylbenzene	700
Tetrachloroethane, 1,1,2,2-	1
Tetrachloroethylene	1
Toluene	600
Trichloroethane, 1,1,2-	3
Trichloroethylene	1
Xylene, m,p	1,000
Xylene, o-	1,000

SVOCs	PRG (µg/L)
Cresol, p-	50
Benzo[a]pyrene	0.1
Dioxane, 1,4-	0.4

Metals	PRG (µg/L)
Lead	5

3.7.4 Preliminary Remediation Goals for Soil Gas

Soil gas concentrations attributed to COCs in soil/fill present unacceptable human health risks to future indoor workers. PRGs for soil gas are as listed for TCE, total xylenes, and naphthalene in Section 3.7.2 for soil.

3.7.5 Preliminary Remediation Goals for Sewer Water

The remediation goal for sewer water at an inactive portion of the northern sewer line (Manhole 8) on Lot 1 is removal followed by reduction of TMV. Remedial alternatives will address the contents of Manhole 8 (water and solids) and the accessible pipe with the wastes.

3.8 Areas and Volumes

Areas and volumes requiring remediation have been quantified with COCs above the PRG for each medium. Estimates of the specific areas and volumes of the media of interest posing unacceptable risks to human health, welfare, and the environment are provided in this section to enable the combination of possible GRAs into remedial alternatives. Estimates are based on the results of the BHHRA and SLERA to identify the lots and the specific COCs at those lots where risks to human health exceed USEPA thresholds or risks to ecological receptors.

3.8.1 Wastes

Waste, including NAPLs and LNAPLs, has been identified in certain remaining process equipment, a UST, Building #15A, and miscellaneous containers. LNAPL was identified in two areas during the RI: north of Building #12 near the USTs and in Building #15A. Based on Phase 1 laboratory results, the LNAPL is identified as diesel fuel/heating oil and is classified as non-hazardous.

Within Building #7, a white chalky talc-looking substance remains in an approximately 5-foot diameter hopper that measures approximately 20 feet in height between the first and the second floors. The top of the hopper is accessible



from the second floor, and the chalky contents are visible approximately 5 feet below the top. The estimated volume of non-hazardous solid waste in the hopper is approximately 11 cubic yards (CY). In Building #12, a plastic 55-gallon drum contains approximately 50 gallons of non-hazardous liquid waste. In Building #17, a five-gallon bucket labeled as a filler contains a solid non-hazardous waste.

A portion of Building #15A (pump house) contains a petroleum-based liquid (NAPL) beneath pooled water under a steel grated floor. The NAPL is approximately 0.5-foot to 0.65-foot thick and very viscous. Assuming that the grate and liquid covers the entire floor plan (approximately 650 square feet), and assuming an average thickness of 0.6-foot, the volume of NAPL in Building #15A is estimated at 2,900 gallons.

There are six USTs located north of Building #12, each measuring approximately 30 feet long by 8 feet in diameter. One of these USTs (UST-5) contains approximately 1,600 gallons of LNAPL (0.9-foot thick) along with approximately 4,100 gallons of water. Based on the depth measurements from the top of the tanks and the approximate dimensions of the tanks, the following table provides estimated volumes as well.

Sample Location	Depth to LNAPL (feet)	Depth to Liquid (feet)	Estimated Liquid Elevation (feet AMSL)	Approximate Volume (gallons)
UST-1	NA ⁽¹⁾	4.62	1.8	4,500 (water)
UST-2/3	NA	3.10 / 3.93	3.3 / 2.5	7,200 (water)
UST-4	NA	6.6	-0.2	1,300 (water)
UST-5	3.95	4.85	2.5	4,100 (water)
				1,600 (LNAPL)
UST-6	NA	2.6	3.8	8,100 (water)
UST-7	NA	0.55	5.9	9,500 (water)

1. NA – not applicable.

Solids currently contained within the inactive sewer at Manhole 8 are also potential source material. Manhole 8 measures approximately 4 feet by 4 feet in plan and approximately 6 feet deep. Approximately 1.2 feet of sewer water and sediment were present within the base of the manhole during sampling events in March and December 2018, or approximately 0.75 CY of combined water and solids. Of this volume, approximately 50 percent or 0.4 CY is estimated to consist of solids.

3.8.2 Soil

From the results of the BHHRA, the soil areas associated with unacceptable risk for non-residential use and the PRGs for COCs are as follows:

Lot	Area (in acres)	COC	PRG (mg/kg)
1	1.229	Lead	800
58	0.2523	TCE	0.02
		Xylenes	7
61	0.265	Lead	800
62	0.492	Lead	800
		Naphthalene	0.6
63	0.541	Lead	800
		Copper	526
64	0.934	Lead	800

Lot	Area (in acres)	COC	PRG (mg/kg)
65	0.289	Lead	800
68	0.534	Lead	800
		TCE	0.02
70	0.456	Lead	800

In addition, SLERA results indicate unacceptable risks to ecological receptors at Lots 67 and 69 due to COPECs in surface soils (0 to 1 foot).

For the purposes of the FS, area and volume estimates provided below are based on exceedances of PRGs, areas of LNAPL observation, hot spots identified in the BHHRA, or for unpaved portions of Lots 67 and 69 to address risks to ecological receptors. Information used for delineation is shown in Appendix A and includes historical sample results as reported in the SCSR (Woodard & Curran, 2015). Actual extent of remedial action will be determined during the remedial design phase. The limits of remedial action will be based on assessment of soil COCs to be removed or managed to achieve cumulative cancer risk estimates below or within the NCP risk range (10^{-4} to 10^{-6}), and the non-cancer hazard index (HI) estimates are at or below the protection goal of 1 or to achieve ARAR compliance. The assessment would include RI samples along with remedial design samples and/or confirmation samples if necessary. It is noted that the delineated areas for the lots identified in this section are those which exceed PRGs for those lots, or that correspond to hot spots or LNAPL observations. Soil volumes below the water table may not be considered for remedial action in Section 5. For remedial action including soil removal, sampling results that are representative of remaining soils above the water table would be used to demonstrate achievement of PRGs.

3.8.2.1 Lot 1

Surface soil at Lot 1 presents risks to current visitors and to a future child visitor from lead. As shown on Figure A-1 (Appendix A), there are two areas where surface soil was delineated in excess of the lead PRG covering a total of approximately 8,360 square feet (SF). Assuming a depth of impacted soil of 2 feet, the total volume of lead exceeding the PRG on Lot 1 is estimated as approximately 16,720 cubic feet or 620 cubic yards (CY).

3.8.2.2 Lot 58

Lot 58 presents unacceptable risks to future indoor workers due to potential soil vapor intrusion of TCE, o-xylene, and m,p-xylenes. Because Lot 58 is owned by the City of Newark, existing buildings within this property may be removed in preparation for future development and would be coordinated with remedial action.

Soil concentrations of xylenes exceeding the PRG are bounded as shown on Figure A-2 (Appendix A). There are two surface soil areas where soil was delineated in excess of the xylenes PRG covering a total of approximately 5,000 SF. Additionally, a separate subsurface soil area of approximately 300 SF was identified from an historical sample. The depth of subsurface soil exceeding the xylenes PRG is assumed to extend to the depth of the historical sample of 12 feet. The total estimated volume of impacted soil in exceedance of the xylenes PRG on Lot 58 is approximately 480 CY.

TCE concentrations in soil exceeding the PRG for TCE are delineated as shown on Figure A-3 (Appendix A). There are two surface soil areas where soil was delineated in excess of the TCE PRG covering a total of approximately 2,520 SF that are almost completely co-located with the xylenes surface soil area. Additionally, a subsurface soil area below a portion of the surface soil area (not co-located with xylenes subsurface area) of approximately 200 SF was identified from an historical sample. The depth of subsurface soil exceeding TCE PRG is assumed to extend to the depth of the historical sample of 16 feet (i.e., into the saturated zone). The total estimated volume of impacted soil in exceedance of the TCE PRG on Lot 58 is approximately 290 CY.

3.8.2.3 Lot 61

Surface soil at Lot 61 presents risks to current and future construction workers from lead. As shown on Figure A-1 (Appendix A), there is one area where surface soil was delineated in excess of the lead PRG covering a total of approximately 2,030 SF. Subsurface soil at this same location also exceeded the lead PRG. Because there is no historical sample data for this lot, historical data from adjacent Lot 63 (B-8) was used to estimate a depth of soil with lead levels exceeding the PRG of 11 feet (i.e., into the saturated zone). The total estimated volume of impacted soil with lead on Lot 61 with concentrations exceeding the PRG is approximately 830 CY.

3.8.2.4 Lot 62

Surface and subsurface soil at Lot 62 presents unacceptable risks to current visitors, construction workers, and child visitors from lead (BLL), and to future indoor workers due to potential soil vapor intrusion of naphthalene. As shown on Figure A-4 (Appendix A), there are no areas where surface or subsurface soil was delineated in excess of the lead PRG.

Soil concentrations of naphthalene exceeding the PRG is delineated as shown on Figure A-5 (Appendix A). There is one surface and collocated subsurface soil area where soil was delineated in excess of the naphthalene PRG covering a total of approximately 4,180 SF and is assumed to extend to a depth of approximately 8 feet based on results for historical sample SB-6 (6.5 to 7 feet, 1,170 µg/kg). The total estimated volume of impacted soil in exceedance of the naphthalene PRG on Lot 62 is approximately 1,240 CY.

3.8.2.5 Lot 63

Surface and subsurface soil at Lot 63 presents unacceptable risks to current and future trespassers and construction workers, and future outdoor workers, indoor workers (dust), and child visitors from lead. In addition, surface soil presents unacceptable risk to a future child visitor from copper in surface soil.

Soil concentrations exceeding the lead PRG is delineated as shown on Figure A-1 (Appendix A). An area with surface soil exceeding the PRG has been delineated covering a total of approximately 29,650 SF, including the footprint of Building #7 (due to subslab soil sample lead PRG exceedance), with some of this area encroaching on Lot 64. An area with subsurface soil exceeding the PRG has also been delineated covering a total of approximately 21,200 SF, including the footprint of Building #7, also encroaching on Lot 64. The subsurface area is assumed to extend to a depth of approximately 11 feet (i.e., into the saturated zone) corresponding to historical sample depths with lead concentrations exceeding the PRG (e.g., B-8). The total estimated volume of impacted soil in exceedance of the lead PRG on Lot 63 is approximately 9,265 CY.

A hot spot analysis included in the BHHRA (Section 2.7) identified three locations from Lot 64 (B-75 at 1 to 3 feet bgs of 8,690 mg/kg, B-74 at 3 to 4 feet bgs of 3,080 mg/kg, and B-70 at 5 to 7 feet bgs of 3,020 mg/kg, which are adjacent to Lot 63) that could affect risk assessment conclusions for future outdoor worker and trespasser exposure to lead in soil from the subsurface that is brought to the surface during site redevelopment. A surface soil hot spot (B-75) area of approximately 940 SF is delineated on Lot 63 (Figure A-1). The volume of surface soil associated with this hot spot is estimated at approximately 70 CY. Subsurface soil has been delineated at two areas on Lot 63 that encroach onto Lot 64 covering a total area of approximately 2,070 SF (i.e., approximately 2,140 SF of combined surface and subsurface soil hot spot area). Assuming a depth of hot spot soil for each delineated subsurface soil area of 8 feet (i.e., approximately 3 feet below the water table), the volume of hot spot subsurface soil is estimated at approximately 460 CY for a total hot spot volume (including soil below the water table) of approximately 530 CY.

Surface soil at one sample location exceeded the PRG for copper. As shown on Figure A-6 (Appendix A), an area of approximately 1,920 has been delineated for further consideration of remedial action for copper that is co-located with

surface soil exceeding the PRG for lead. Assuming the depth of soil with exceedance of the copper PRG to extend to the full surface soil depth of 2 feet, the delineation corresponds to an estimated volume of approximately 145 CY.

Observations of free product (oil-like substance) in soil were observed in soil during the drilling of Monitoring Well MW-201 between the ground surface and 7.2 feet bgs. Following installation, this monitoring well did not have a measurable thickness of LNAPL. Monitoring wells in this area (including Monitoring Well MW-201) did not have a measurable thickness of NAPL. Because soil sample results from the associated soil boring (B-33) did not exceed ARARs for VOCs or SVOCs, and there was no LNAPL observation in other nearby borings, and no measurable thickness of LNAPL in a well, the volume of soil impacted with LNAPL is believed to be relatively limited. For the FS, an area of 820 SF has been delineated as shown on Figure A-1 (Appendix A) for soil containing LNAPL that is co-located with surface and subsurface soil exceeding the PRG for lead. Assuming a depth of 7 feet, a total volume of soil with LNAPL is conservatively estimated as approximately 210 CY.

3.8.2.6 Lot 64

Surface and subsurface soil at Lot 64 presents unacceptable risks to current and future construction workers and trespassers, and future outdoor workers, and child visitors from lead. Surface and subsurface area and volume encroaching on Lot 64 from the delineation of lead impacted soil on Lot 63 is included in the section regarding Lot 63 and, therefore, is not included for Lot 64 to avoid double counting. As such, there is no additional subsurface soil exceeding the lead PRG that has not been accounted for with Lot 63 (Section 3.8.2.5).

Surface soil concentrations exceeding the lead PRG are delineated as shown on Figure A-1 (Appendix A). Near the northwest corner of the Lot 64 covering, an area of approximately 2,800 SF has been delineated with surface soil exceeding the lead PRG. The depth of surface soil impacted with lead is assumed to be 2 feet. The total estimated volume of impacted soil in exceedance of the lead PRG on Lot 64 is approximately 210 CY.

Observations of a thick, oil-like substance were noted at Borings B-34 and B-35 at depths between 5 and 7 feet bgs. These borings are located to the east and south of the UST area. A third boring completed southeast of the UST area (B-90) also encountered an oil-like substance between 11 and 13 feet bgs (below the water table). Monitoring wells in the vicinity of the USTs did not have a measurable thickness of NAPL; however, a TWP installed at B-34 contained LNAPL. Because soil sample results from the borings listed above did not exceed ARARs for VOCs or SVOCs, and there was no LNAPL observation in other nearby borings, and no measurable thickness of LNAPL in a well, the volume of soil impacted with LNAPL is believed to be relatively limited. For the FS, soil containing LNAPL on Lot 64 has been delineated as shown on Figure A-1 (Appendix A), covering a total of approximately 2,200 SF. Assuming a smear zone of 2 feet, a total volume of soil with LNAPL is conservatively estimated of approximately 160 CY.

3.8.2.7 Lot 65

Surface soil at Lot 65 presents unacceptable risk to current construction workers as well as future child visitors from lead.

As shown on Figure A-7 (Appendix A), the area where surface soil was delineated in excess of the lead PRG covers a total of approximately 6,630 square feet (SF), including encroachment onto Lot 64 to the north. Assuming a depth of impacted soil of 2 feet, the total volume of lead exceeding the PRG on Lot 65 is estimated as approximately 490 CY.

3.8.2.8 Lot 67

Lot 67 presents risk to ecological receptors from surface soil with ESV exceedances for COPECs (primarily for PAH compounds and certain metals). Although vegetation is minimal, there is approximately 5,475 SF of unpaved area available for foraging and habitation on this lot.

3.8.2.9 Lot 68

Surface and subsurface soil at Lot 68 presents unacceptable health risks to current and future construction workers, as well as future child visitors due to potential exposure to lead. In addition, TCE in surface and subsurface soil presents unacceptable health risks to future indoor workers due to potential exposure via vapor intrusion.

Figure A-7 (Appendix A) shows surface and subsurface soil areas delineated for lead PRG exceedance. There are two separate surface soil areas of approximately 3,570 SF delineated on Lot 68. Although both of these areas abut areas on adjacent lots that have been identified with PRG exceedances for lead, only the areas within Lot 68 are included in the estimate. The depth of impacted surface soil is assumed to be 2 feet.

Two areas of subsurface soil on Lot 68 have been delineated for lead PRG exceedance totaling approximately 9,430 SF. Although the northernmost portion of the delineated subsurface area encroaches onto Lot 65, the area is assigned to Lot 68 because there were no subsurface soil samples on Lot 65 exceeding the lead PRG. The maximum depth of subsurface lead PRG exceedance is assumed to be 5 feet based on a lead concentration of 450,000 µg/kg reported for RIR sample B-82 collected from the 5- to 7-foot depth. The total volume of surface and subsurface soil in exceedance of the lead PRG on Lot 68 is estimated at approximately 2,010 CY.

Figure A-8 (Appendix A) shows surface and subsurface soil areas delineated for TCE PRG exceedance. As indicated, a surface soil area of approximately 8,510 SF has been delineated on Lot 68 that encroaches onto Lot 67. The depth of impacted surface soil is assumed to be 2 feet. The subsurface soil area delineated for TCE PRG exceedance is approximately 3,530 SF and also encroaches easterly onto Lot 67. The depth of subsurface TCE PRG exceedance is assumed to correspond to the historical sampling results showing TCE impacts to depths of approximately 7 feet (e.g., sample GP-2, S-2, included on Figure A-8). The total volume of soil with TCE concentrations exceeding the respective PRG is estimated at approximately 1285 CY. It is noted that a subsurface soil with lead concentrations exceeding the PRG of approximately 2,170 SF is collocated with soil exceeding the TCE PRG to a depth of 5 feet (approximately 240 CY), but TCE and lead exceedance areas are otherwise separate.

3.8.2.10 Lot 69

Similar to Lot 67, Lot 69 presents risk to ecological receptors from surface soil with ESV exceedances for COPECs. There is a limited approximately 9,680 SF of unpaved area available for foraging and habitation on this lot.

3.8.2.11 Lot 70

Subsurface soil at Lot 70 presents unacceptable risks to current and future construction workers, trespassers, and outdoor workers from lead. Additionally, lead PRG exceedance presents unacceptable risk to current visitors and future child visitors. PCB concentrations exceeding the respective PRG were also identified in two subsurface soil samples from Lot 70.

As shown on Figure A-9 (Appendix A), two areas of subsurface soil on Lot 70 have been delineated for lead PRG exceedance totaling approximately 13,560 SF. Although the delineated subsurface area encroaches onto Lot 57 and Lot 59, there were no unacceptable health risks identified for these lots, and only one subsurface soil sample from either lot (Lot 57) contained lead at a concentration exceeding the PRG. The average depth of subsurface lead PRG exceedance is assumed to be 6 feet based on lead concentrations reported for historical samples as shown on Figure A-9 (Appendix A). The total volume of subsurface soil in exceedance of the lead PRG on Lot 70 is estimated at approximately 3,020 CY.

PCB concentrations exceeding the PRG were identified at two areas of Lot 70 that are collocated with lead PRG exceedance. The total area delineated for PCB PRG exceedance is approximately 2,220 SF. The average depth of



PCB PRG exceedance is assumed as the same depth of 6 feet as for lead. The total volume of subsurface soil in exceedance of the PCB PRG on Lot 70 is estimated at approximately 500 CY.

3.8.3 Groundwater

Potable use of site groundwater, if to occur in the future, would pose unacceptable risk to human health. Groundwater use at the Site is unlikely because shallow groundwater is brackish, and the Site and surrounding area are served by the City of Newark's potable water system. Currently, Lots 67, 68, 69 and 70 have restrictions in place under NJDEP regulations to prevent groundwater use.

As summarized in Section 3.4.2, groundwater contains COC above ARARs. Shallow fill groundwater with non-metal COC being carried through the FS are associated with three areas listed in Section 3.4.2.

The Site consists of large quantities of fill material that were historically placed into the river and adjacent shore to raise the surface elevation to today's approximate elevation. The origin of fill is not known but because of the duration of filling, more than one source of the fill is likely. Fill material is defined as the material present above the silt loam (which represents the former Passaic River sediment bed and native material). The fill material consists predominantly of sands, silts, and gravel along with man-made materials such as brick, pieces of concrete block, wood, glass, and cinders. Shallow fill unit wells are screened in fill material. The natural conditions of brackish water influences from Passaic River tides can also affect groundwater metal concentrations. The allocation of the metals in groundwater due to natural conditions, pre-placement of contaminated fill, or a release(s) was not an RI objective. However, as listed in Section 3.4.2, lead is a groundwater COC, other metals are not.

3.8.4 Soil Gas

As indicated in the BHHRA, risks to future indoor workers from soil gas intrusion are unacceptable at Lots 58 (TCE and xylenes), 62 (naphthalene), and 68 (TCE and xylenes). It is assumed that soil gas concentrations are relatively consistent within each of the areas delineated for soil vapor COCs as provided in Section 3.8.2. Accordingly, the areas identified for Lots 58, 62, and 68 for TCE, xylenes, and naphthalene in Section 3.8.2 are the same for soil gas delineation.

3.8.5 Sewer Water

Impacted sewer water is assumed to comprise approximately 50 percent of the volume of solids and liquid in Manhole 8. Based on measurements recorded in March and December 2018, the volume of sewer water in Manhole 8 is estimated at approximately 0.4 CY. Cleaning of the manhole and the one unplugged pipe would generate an estimated 300 gallons (approximately 1.5 CY) of liquids, for a total of approximately 2 CY of water.

4. IDENTIFICATION AND SCREENING OF TECHNOLOGIES AND PROCESS OPTIONS

4.1 Identification and Screening of Technologies

Technologies and process options were compiled for the GRA categories that could potentially satisfy RAOs for each medium of interest. Technology types are general categories of remedial technologies, while process options refer to specific processes within each remedial technology type. Representative remedial technologies and process options that are retained are used to develop remedial action alternatives in Section 5, either alone or in combination with other technologies.

Screening tables identifying remedial technology types, process options, and screening results are presented for waste, soil/fill, groundwater, sewer water, and soil gas (Tables 4-1, 4-2, 4-3, 4-4, and 4-5, respectively). Assembled process options were subjected to a preliminary technology screening to verify their applicability to Site contaminants and physical setting. The technology screening approach is based on the procedures outlined in the Interim Final Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA (USEPA, 1988). Potential candidate technologies were initially presented in the ICT Memorandum (Woodard & Curran, 2019) approved by USEPA on July 17, 2019. Since that time, more recent data from the final RI and BHHRA have been used to update screening results.

The technology screening evaluation process uses three criteria: effectiveness, implementability, and relative cost. Among these three, the effectiveness criterion outweighs the implementability and relative cost criteria. These criteria are described below.

Effectiveness: This evaluation criterion focuses on the effectiveness of process options to reduce the TMV of contamination for long-term protection and to meet the RAOs and PRGs. It also evaluates the potential impacts to human health and the environment during construction and implementation and how proven and reliable the process is with respect to site-specific conditions. Technologies and process options that are not effective are eliminated using this criterion.

Implementability: This evaluation criterion encompasses both the technical and administrative feasibility of the technology or process option. It includes an evaluation of pretreatment requirements, remedial construction requirements, residuals management, the relative ease or difficulty of operation and maintenance (O&M), and the availability of qualified vendors. Technologies and process options that are clearly not implementable at the Site are eliminated using this criterion.

Relative Cost: Cost plays a limited role in the screening process. Both capital and O&M costs are considered. The cost analysis is based on engineering judgment, and each process is evaluated as to whether costs are low, medium, or high relative to the other options within the same GRA category.

4.2 Evaluation of Technologies and Selection of Representative Technologies

Following the preliminary technology screening, the GRAs, remedial technologies, and process options retained as potential components of a comprehensive site remedy for further evaluation are summarized by medium of concern below.

4.2.1 Waste

Retained GRAs for waste are no action, removal, and off-site disposal. Process options for each GRA are proven and readily implemented as wastes at the Site have been identified.

GRA	Remedial Technology	Process Options
No action	Not applicable	Not applicable
Removal	Mechanical transfer	Containerization or transport vehicle
Disposal	Disposal (off-site)	Solid waste landfill, used oil recycling, or treatment and disposal

4.2.2 Soil/Fill

Retained GRAs, remedial technologies, and process options for soil/fill are listed below:

GRA	Remedial Technology	Process Options
No action	Not applicable	Not applicable
Institutional controls/access restrictions	Land use restrictions	Deed notice
		Zoning/ordinances
	Barriers	Fencing/signs
Engineering controls	Cover systems	Single-layer cap
		Combination cap
	Vertical barriers	Shoreline revetment
		Sheet piling
		Soil berm
Removal	Excavation	Mechanical
Treatment	In-situ treatment (biological)	Bioventing
	In-situ treatment (physical)	Soil vapor extraction (SVE)
		Air stripping and air sparging
		Chemical oxidation
	In-situ treatment (immobilization)	Stabilization/solidification
	Ex-situ treatment (immobilization)	Stabilization/solidification
	Ex-situ treatment (thermal)	Thermal desorption
Disposal	Disposal (off-site)	Solid waste and hazardous waste landfills

Soil/fill with elevated concentrations of lead that is excavated may classify as RCRA characteristic waste (Waste Code D-008) if the leachate concentration of lead exceeds the Toxicity Characteristics Leaching Procedure (TCLP) regulatory limit of 5 mg/L. As a result, off-site disposal would need to comply with RCRA LDR requirements via treatment to eliminate the RCRA characteristic or alternative LDR treatment standards under 40 CFR 268.49 (Phase IV LDR). For this Site, TCLP data are not available. Using the 20 times rule, the soil/fill lead concentration that may fail TCLP would be 100 mg/kg. Therefore, some lead-contaminated soil/fill, including some that may be collocated with PCBs, may be considered characteristic waste. LDRs are an action-specific ARAR.

The Toxic Substances Control Act (TSCA) provides the Federal PCB remediation policy. Excavated soil containing PCBs would classify as bulk remediation waste. Bulk PCB remediation wastes at concentrations of less than 50 ppm may be disposed of at an approved PCB disposal facility; or when disposed pursuant to Section 761.61(a) or (c), a permitted municipal solid waste or non-municipal non-hazardous waste facility; or a RCRA Section 3004 or Section 3006 permitted hazardous waste landfill. Bulk PCB remediation waste at concentrations of 50 ppm or greater must be disposed of in a RCRA Section 3004 or 3006 permitted hazardous waste landfill or an approved PCB disposal facility (e.g., incinerator, chemical waste landfill) via an approved alternate disposal method (USEPA, 2005). TSCA is an action-specific ARAR.

Under NJDEP SRP policy, soils with PCB concentrations above 0.2 ppm require a deed notice and, when above 1 ppm, require a deed notice and cap. NJDEP policy allows for contaminants with appropriate institutional and engineering controls to be non-permanently remediated if the remedy is found to be protective of human health and the environment. NJDEP SRP policy is a TBC.

SVE is retained for possible application under buildings to mitigate vapor intrusion by treating soil containing COPCs, if necessary. Given the relatively thin vadose zone, SVE, air stripping, and air sparging efficiency may be poor due to the potential for short-circuiting to the atmosphere in the absence of a cover system. New deed notices, capping, and a vertical barrier would require landowner consent to maintain these controls. Capping, vertical barrier, stabilization/solidification, and removal/disposal could be disruptive of current commercial activities. The process options retained for further consideration could be implemented on a site-wide basis or an individual lot basis.

During ebb tide and precipitation/flooding events, soil/fill may be susceptible to erosion, sloughing, and transport off-site. Surface water may infiltrate through the bulkhead and exposed shoreline due to tidal effects. When tidal current is flowing inland (i.e., flood tide) and during river flooding events, the soil/historical fill along with the exposed shoreline may be susceptible to infiltration of surface water and river sediment deposition. The existing bulkhead could be extended along the riverbank and raised higher. Vertical barriers such as sheet piling could be installed inland and either independent of or connected to the bulkhead to prevent or minimize off-site transport of soil containing COCs. A barrier along the river could be implemented on an individual lot basis to enhance the barrier provided by the existing bulkhead. Berms along the river could be a component of the vertical barrier to control surface water movement. Vertical containment and flood protection measures could be coordinated with property redevelopment.

4.2.3 Groundwater

Retained GRAs, remedial technologies, and process options for groundwater as listed below have been updated from the approved ICT Memorandum based on more recent groundwater data:

GRA	Remedial Technology	Process Options
No action	Not applicable	Not applicable
Institutional controls/access	Use restrictions	CEA
		Well restriction area (WRA)
Restrictions	Barriers	Fencing/signs
Engineering controls	Subsurface barriers	Slurry walls
		Sheet piling
Treatment	In-situ (biological)	Bioremediation
		Biosparging
	In-situ (physical)	Immobilization
		Air sparging
	In-situ (chemical)	In-situ chemical oxidation
		In-situ chemical reduction
MNA	Monitoring	Not applicable
Disposal	Disposal (off-site)	Discharge to local POTW
	Disposal (on-site)	Discharge to surface water

Groundwater use restrictions under NJDEP regulations require property owner notification but not owner permission. It is noted in the screening tables that ex-situ technologies and process options for groundwater have not been retained because there are no unacceptable health risks under the current use scenarios and CEAs are anticipated for those lots currently without one to prevent groundwater use for other than monitoring. RI data (March 2018 - February 2019) suggest groundwater quality has improved. The improvement could be due to several factors including source removal

(illegal activities reduced or stopped) and natural degradation. Extraction via pumping would induce infiltration of surface water from the adjacent Diamond Alkali Superfund Site. As shown on figures and discussed in Section 3.4.2, groundwater concentrations in very limited areas of the Site exceed ARARs for organic COCs. Furthermore, while pump and treat options may reduce TMV of organic COCs, no pump and treat option would eliminate dissolution of residual recalcitrant inorganic COC in urban fill that remains in contact with groundwater. Pump and treat may offer marginal improvement of groundwater quality and would have more negative environmental impact than in-situ treatment options. The options retained for further consideration could be implemented on a site-wide basis or an individual lot/area basis.

4.2.4 Soil Gas

Retained GRAs, remedial technologies, and process options for soil gas are listed below. Retained GRAs, remedial technologies, and process options for soil containing COCs (potential source of soil gas) are listed in Section 4.2.2.

GRA	Remedial Technology	Process Options
No action	Not applicable	Not applicable
Institutional controls	Use restrictions	Deed notice
		CEA
Engineering controls	Subsurface barriers	Vapor barrier
Removal	Subsurface depressurization system (SSDS)	Active SSDS
Treatment	Ex-situ treatment (physical)	Immobilization/adsorption
		Photocatalytic oxidation

Based on indoor air sample results, health risks posed by indoor vapors in currently occupied buildings are below acceptable risk thresholds. Risk assessment results indicate that vapor barriers and/or passive depressurization systems may be required for future indoor workers at Lots 58, 62, and 68. Retained process options are proven and readily implemented and would be implemented on an individual lot basis.

4.2.5 Sewer Water

Retained GRAs for sewer water and solids are no action and removal with off-site disposal. Retained process options are proven and readily implemented and would likely be implemented on a lot by lot basis, and the sewer water medium is found on Lot 1.

GRA	Remedial Technology	Process Options
No action	Not applicable	Not applicable
Removal	Mechanical transfer	Containerization or transport vehicle
		Pumped
Disposal	Disposal (off-site)	Discharge to local POTW
		Disposal to off-site treatment, storage, and disposal (TSD) facility

5. DEVELOPMENT AND SCREENING OF ALTERNATIVES

Commented [SM10]: Common elements; FYRs

In this section, remedial alternatives for wastes, surface and subsurface soils, groundwater, sewer materials, and soil gas at the Site are formed to address the RAOs. The technologies and process options retained in the screening procedures described in Section 4 are developed into medium-specific remedial alternatives. The remedial alternatives were initially presented in the DASRAT Memorandum (August 28, 2019) approved by USEPA on February 27, 2020. Since that time, more recent data from the Final RIR, BHHRA, and SLERA have been used to update remedial alternatives.

These assembled alternatives are then subjected to further screening in Section 6. Consideration of the no-action alternative is required by the NCP.

To develop remedial alternatives for the Site, representative process options were selected from the same groups of remedial technologies, as appropriate. However, other process options may still be applicable and should be considered during the remedial design stage of the project. Similarly, quantities of affected materials described in this section are preliminary estimates based on currently available data. It is anticipated that, where appropriate, additional delineation data may be obtained during remedial design activities as needed to more accurately define the extent of materials subject to remedial action.

5.1 Wastes

Wastes at the Site include containerized waste and LNAPL in the USTs and Building #15A, as described in Section 3.8.1. Wastes present in other site media are addressed with those media: Manhole 8 is addressed in Section 5.4 (Sewer), and LNAPL in soils is addressed in Section 5.2 (Soil/Fill).

As noted in Section 4.2, the remaining technologies and process options for source materials include the following:

GRA	Remedial Technology	Process Options
No action	Not applicable	Not applicable
Removal	Mechanical transfer	Containerization or transport vehicle
Disposal	Disposal (off-site)	Solid waste landfill, used oil recycling, or treatment and disposal

Based on the remaining GRAs and process options, there are two decisions to be made for wastes at the Site in certain remaining process equipment and containers:

- whether or not to take action; and
- if action occurs, what means should be used to remove and dispose of the materials.

As discussed in Section 3.8, approximately 37,000 gallons of liquid and solid wastes remain at the Site in the various containers and six USTs. Although the risks associated with these materials have not been quantified, RAOs include securing or removing the materials to the extent practicable, preventing uncontrolled movement of the materials, and addressing human and ecological exposure to the materials. Note that wastes which may be present in other site media (soil or groundwater) are addressed with those media.

5.1.1 Waste Alternative 1 — No Action

Under this alternative, no action would be taken. This alternative is retained for comparison with the other alternatives as required by the NCP. Under no action, remaining source materials at the Site would be left in place, and no means of securing the materials to prevent future release to the environment would be implemented.

5.1.2 Waste Alternative 2 — Removal and Off-Site Disposal

This alternative consists of the transfer of wastes into appropriate containers or transport vehicles for off-site recycling or disposal, along with proper closure of USTs by removal. The means for disposal of the various wastes would be determined during the remedial design; however, for the purposes of this FS, certain assumptions can be made, pending disposal characterization. Solid wastes such as the hopper in Building #7 would most likely be disposed of in an appropriate solid waste landfill. Oils and other NAPLs contained within process equipment and USTs would either be sent to a recycling facility or for treatment and disposal. Water contained in the USTs would be transferred to an appropriate facility for treatment and disposal.

Upon removal of contents, the USTs would be removed in accordance with New Jersey tank closure regulations.

5.2 Soil/Fill

As discussed in Section 3.8.2, soils with COC concentrations associated with unacceptable human health risk are present for metals at Lots 1, 61, 62, 63, 64, 65, 68, and 70, and VOCs at Lots 58, 62, and 68. Additionally, two areas of LNAPL-containing soils on Lot 64 and Lot 63 which contain concentrations of certain COCs above ARAR-based criteria were also determined to require further assessment in the FS. In addition, SLERA results indicate unacceptable risks to ecological receptors at Lots 67 and 69 due to COECs in surface soils.

The remaining technologies and process options for source materials are described in Section 4.2.

GRA	Remedial Technology	Process Options
No action	Not applicable	Not applicable
Institutional controls/access restrictions	Land use restrictions	Deed notice
		Zoning/ordinances
	Barriers	Fencing/signs
Engineering controls	Cover systems	Single-layer cap
		Combination cap
	Vertical barriers	Shoreline revetment
		Sheet piling
		Soil berm
Removal	Excavation	Mechanical
Treatment	In-situ treatment (biological)	Bioventing
	In-situ treatment (physical)	SVE
		Air stripping and air sparging
	In-situ treatment (chemical)	Chemical oxidation
	In-situ treatment (immobilization)	Stabilization/solidification
	Ex-situ treatment (immobilization)	Stabilization/solidification
	Ex-situ treatment (thermal)	Thermal desorption
Disposal	Disposal (off-site)	Solid waste and hazardous waste landfills

Based on the remaining GRAs and process options (Section 4.2), there are four decisions to be made for soil/fill at the Site:

- whether or not to take action;
- if action occurs, whether to leave the soil in place or to excavate for off-site disposal;

- if the soil is left in place, whether to cover/isolate or treat; and
- what, if any, institutional controls are needed in combination with the selected alternatives.

It is noted that for each individual lot, the decisions made and the corresponding selected remedial action may be different. As discussed in Section 3.8.2, approximately 19,180 CY of soils have been identified as having concentrations above PRGs and/or identified as hot spots or associated with LNAPL observations, broken down by lot as follows:

- Lot 1 – 929 SY with 620 CY of surface soils for lead;
- Lot 58 – 611 SY with 584 CY of surface and subsurface soils for VOCs, of which at least 140 CY is below the water table;
- Lot 61 – 226 SY with 830 CY of surface and subsurface soils for lead, of which at least 450 CY is below the water table;
- Lot 62 – 464 SY with 1,240 CY of surface and subsurface soils for VOCs, of which at least 400 CY is below the water table;
- Lot 63 – 3,507 SY with 9,410 CY of surface and subsurface soils for metals, of which at least 4,700 CY is below the water table, and 91 SY with 120 CY of LNAPL-containing subsurface soils (assuming that the topmost 3 feet of soil from the LNAPL area is reused as backfill);
- Lot 64 – 311 SY with 210 CY of surface soils for lead, and 244 SY with 160 CY of LNAPL-containing subsurface soils;
- Lot 65 – 737 SY with 490 CY of surface soils for lead;
- Lot 68 – 1,287 SY with 1,312 CY of surface and subsurface soils for lead and 1,283 CY of surface and subsurface soils for VOCs, of which at least 300 CY is below the water table (approximately 240 CY of soils exceed PRGs for both lead and VOCs); and
- Lot 70 – 1,507 SY with 3,020 CY of surface and subsurface soils for lead, of which at least 500 CY is below the water table, and 500 CY of collocated soils for PCBs.

Additionally, approximately 1,680 SY of surface soils on Lots 67 and 69 were identified for consideration due to potential risks to ecological receptors. For purposes of this FS, the water table was assumed to be an average of 5 feet bgs, and surface soil is defined as 0 to 1 foot bgs.

RAOs include addressing human exposure pathways, ecological pathways, the potential off-site transport, and the potential leaching to groundwater and surface water.

For alternatives which involve excavation or treatment, estimates of soil quantities exceeding a PRG are used, such that remaining soil concentrations would comply with health-based or ARAR-based criteria. Actual cleanup levels may be based on these criteria or as otherwise determined during the remedy selection process.

For alternatives involving a surface action such as containment or access restrictions, the entire area of interest was considered due to the small incremental cost associated with increasing the extent of the action for these areas. Actual quantities and extents of affected soil handled during remedial activities may differ, depending on conditions at the time of the remedial action and the target cleanup concentrations. Depending on the remedy selected, sampling and

analysis for specific COCs during remedial design and/or remedial action may be used to more accurately define quantities and plan remediation.

5.2.1 Soil/Fill Alternative 1 – No Action

Under this alternative, no action would be taken. This alternative is retained for comparison with the other alternatives as required by the NCP. Under no action, new deed restrictions and other institutional controls would not be implemented, and future use of the subject areas would be unrestricted except that existing NJDEP-approved institutional and engineering controls would remain intact.

5.2.2 Soil/Fill Alternative 2 – Institutional Controls and Limited Action

For this alternative, deed notices would be recorded on all 15 lots. Existing deed notices would be revised to reflect RI results and existing engineering controls for applicable lots. Fencing would be maintained and enhanced as appropriate in order to limit unauthorized access to the area and prohibit future use of the area in a manner which may expose human receptors to unacceptable risk. Deed restrictions establishing requirements for new construction (i.e., vapor barriers and/or passive or active depressurization systems to prevent indoor vapor intrusion) and ensuring future use consistent with the use assumptions of the BHHRA would be developed and implemented. Regular site inspections would be performed to ensure compliance with the deed restrictions. Existing zoning and local ordinances associated with use of the Site would also be reviewed and modified as appropriate to ensure compliance with the objectives of this alternative. No attempt would be made to excavate, cover, and/or treat the affected soil. For the purposes of this soil alternative, it is assumed that the entire Site would be subject to the limited actions described herein. Under this alternative, the existing NJDEP-approved controls would remain unchanged.

Note that the actions included in this alternative may also be relevant for other alternatives (e.g., engineering controls, excavation) where potential unacceptable exposure risks remain after completion of the remedial activities.

5.2.3 Soil/Fill Alternative 3 – Engineering and Institutional Controls

Under Alternative 3, soil containing COCs on Lots 1, 58, 61, 62, 63, 64, 65, 68, and 70 would be left in place, and would be addressed by engineering controls (cover system) and institutional controls (deed notice), for the potential unacceptable risk. Soils presenting potential unacceptable ecological risks on Lots 67 and 69 would also be addressed by these controls. In addition, the bulkhead would be reinforced or reconstructed, as appropriate, with new sheet piling or shoreline revetment in order to minimize the potential for interaction between the Site and surface water.

For Lots 61, 62, 63, 64, 65, 68, and 70, there is unacceptable risk associated with outdoor workers exposed to concentrations in the top 2 feet of soil, or from subsurface soil moved to the surface during redevelopment, or there is COC ARAR exceedance. An existing deed notice with engineering control (concrete slab) presently exists within portions of the building footprint on Lot 63. Asphalt pavement is the engineering control in the existing Lots 68 and 70 deed notice. Other lots at the Site have concrete or asphalt surface pavement, although not part of a deed notice. During the remedial design, these surfaces would be inspected to determine their suitability to be used as a cover. Some existing pavement may need to be repaired to be used as an engineering control.

Two other capping options were retained in the DASRAT Memorandum, including a single-layer cap (such as a soil or asphalt cover) and a multi-layer combination cap. While both types of cap accomplish the objective of preventing exposure to impacted soils, a single-layer cap is judged to be more compatible with the likely long-term future use of the Site. Accordingly, a 6-inch asphalt cap is proposed over exterior portions of the lots to prevent direct exposure to those soils. The estimated extent of the asphalt cap, including Lots 67 and 69, is approximately 12,600 SY, some of which is currently covered by concrete or asphalt. Surface water management is a capping component to reduce potential off-site transport of soil with COCs. A cover consisting of soil, recycled concrete aggregate and/or alternate

fill may be an appropriate substitution for asphalt based on reasonable future use during remedial design. Different covers may be appropriate for different lots. Use of alternative covers are to be approved by USEPA and be in compliance with state regulations.

The existing bulkhead along the riverfront consists of various materials (steel, wood, concrete), and varies in condition from poor/failing to good, with the wood bulkhead sections generally in the worst condition and the steel and concrete sections generally in the best condition. A geotechnical investigation would be required for both bulkhead enhancement process options. For the purposes of this FS, one process option is that wood sections would be replaced with new sheet piling tied into the adjacent steel and concrete sections of the wall. Additionally, steel sheeting would be installed along Lots 67 and 63 where a bulkhead is not currently present. Approximately 800 feet of new bulkhead walls would be constructed.

Design and installation of either bulkhead enhancement will incorporate active stormwater discharge pipes as appropriate, and existing inactive river wall pipes would be sealed.

The second bulkhead enhancement process option is shoreline revetment which would require sloping the shoreline back and placement of an impermeable liner and R-6 or larger riprap. Approximately 800 feet of shoreline revetment would be constructed.

Both bulkhead enhancement options reduce the potential interaction between the Site and the Passaic River. Both options are also compatible with remedial action being designed in the Lower 8.3 miles of the Lower Passaic River, in accordance with the March 2016 Diamond Alkali OU2 ROD. Currently, the OU2 remedial design anticipate bank-to-bank sediment dredging with dredging offsets and placement of a cap over remaining river sediment. The installation of the shoreline revetment option would disturb less river sediment than the sheet pile wall.

In either bulkhead enhancement scenario, the effective height of the bulkhead wall could be increased with soil berms.

This alternative would also include the limited action activities of Soil Alternative 2 to prevent future disturbance of the cover system and maintenance of the bulkhead. Under this alternative, proposed engineering and institutional controls would be in addition to existing NJDEP-approved controls.

For Lots 58, 62, and 68, risk in excess of threshold is associated with indoor workers exposed to organic vapors from soil impacts. Currently, these lots either have no buildings on them, or existing buildings are vacant. Soil gas alternatives are addressed in Section 5.5.

5.2.4 Soil/Fill Alternative 4 – Excavation and Off-Site Disposal

Under this alternative, COC-impacted soil is excavated and transported to a permitted off-site facility for subsequent treatment (if needed) and disposal. The excavated areas would be backfilled with fill material selected in accordance with the NJDEP "Fill Material Guidance for SRP Sites" dated April 2015, and finished in a manner consistent with current conditions (i.e., asphalt paving, grass, etc.) or as otherwise appropriate for subsequent site redevelopment plans if available, with appropriate erosion and surface drainage controls implemented. Off-site disposal would likely occur at an appropriately licensed solid waste or hazardous waste landfill, depending on the results of disposal characterization sampling which would be conducted as part of the remedial design.

The extent of excavation will be determined during the remedial design phase. The limits of excavation will be based on assessment of soil COCs to be removed or managed to achieve cumulative cancer risk estimates below or within the NCP risk range (10^{-4} to 10^{-6}), and the non-cancer HI estimates are at or below the protection goal of 1 or to achieve ARAR compliance. The assessment would include RI samples along with remedial design samples and/or confirmation samples if necessary.

For the purposes of this document, it is assumed that for Lots 1, 58, 61, 62, 63, 64, 65, 68, and 70, select soils above the water table with COC concentrations above the PRGs (approximately 10,800 CY), including LNAPL-impacted soil, would be excavated and disposed, such that remaining soils above the water table would be in compliance with health-based or ARAR-based cleanup goals. Actual volumes of soil to be disposed of will be dependent on the determined cleanup levels, results of further delineation during remedial design, and post-excavation sampling. Excavation could extend across lot boundary lines as needed to meet remedial goals. It is assumed that soils located beneath existing buildings would not be excavated.

As part of this alternative, an asphalt cap would be placed on Lots 67 and 69 (refer to Soil/Fill Alternative 3 for details) to address potential ecological exposure associated with COCs in surface soils on those lots.

As the scope of this alternative is based on risks calculated under specific assumed future use of the Site, institutional controls would be implemented, such as deed restrictions, to ensure that the future use of the Site is consistent with the assumptions of the BHHRA.

5.2.5 Soil/Fill Alternative 5 – Hot Spot Excavation and Capping

This alternative combines the excavation and off-site disposal aspects of Soil/Fill Alternative 4 for lead-impacted soils on Lots 63 and 64 with the capping aspects of Soil/Fill Alternative 3 for the remaining affected soils. As with the other alternatives, institutional controls such as deed restrictions would be implemented to ensure that the future use of the Site is consistent with the assumptions of the BHHRA.

The extent of hot spot excavation will be determined during the remedial design. The limits of hot spot excavation will be based on assessment of soil COCs to be removed or managed to achieve cumulative cancer risk estimates below or within the NCP risk range (10^{-4} to 10^{-6}), and the non-cancer HI estimates are at or below the protection goal of 1 or to achieve ARAR compliance. The assessment would include RI soil samples along with remedial design samples and/or confirmation samples if necessary.

For the purposes of the FS For Lots 63 and 64, select hot spot soils above the water table with lead concentrations above the PRG (assumed to be approximately 404 CY) and LNAPL-impacted soil (approximately 280 CY) would be excavated and disposed. Actual volumes of soil to be disposed of will be dependent on the determined cleanup levels and the results of further delineation during remedial design, and post-excavation sampling. It is assumed that soils located beneath existing buildings would not be excavated.

Because of the extent of fill, some of which has been identified as historic fill, excavation under this alternative does not reduce the extent of capping. The remaining affected soil on Lots 1, 58, 61, 62, 63, 64, 65, 68, and 70 would be capped to address the associated unacceptable human health risk. Soils presenting potential unacceptable ecological risks on Lots 67 and 69 would also be capped. Capping under this alternative would be as described in Soil/Fill Alternative 3 for a 6-inch asphalt cap with an assessment of existing surface pavement.

5.2.6 Soil/Fill Alternative 6 – In-Situ Treatment

Under this alternative, the affected soils would be subject to one or more of several readily implementable and well developed in-situ treatment methods. The specific methods to be implemented for each lot will depend on the nature of the contaminants to be treated.

For the soils in lots where the primary COC is lead, stabilization/solidification would be the most applicable means of treatment. This process would involve the injection and mixing of an appropriate binding agent (such as cement, lime, or kiln dust) using a backhoe or large-diameter auger. After completion of stabilization activities, the treated areas would be capped as described under Soil/Fill Alternative 3. Note that due to the increase in soil volume inherent with this approach, along with the need to cap treated soils, it may be necessary to remove and properly dispose of the top

12 to 18 inches of soil prior to treatment, so that the elevation of the final surface does not change. Bench-scale studies may be appropriate to determine the most effective binding agent and mixing ratio to treat site soils.

For the soils in Lots 58, 62, and 68, where VOCs are also COCs, soil mixing with a chemical oxidant, such as a persulfate, would be considered the most applicable in-situ treatment approach. For this option, a slurry of the selected oxidant would be mixed with VOC-impacted soils using large-diameter augers or a backhoe, depending on the area and depth of treatment required. Bench-scale studies would be included as part of the remedial design to evaluate the most effective oxidant for soils in each lot. For Lots 62 and 68, where lead and VOCs are both present above target concentrations, chemical oxidation could be followed by stabilization.

As part of this alternative, an asphalt cap would be placed on Lots 67 and 69 to address potential ecological exposure associated with COCs in surface soils on those lots.

As with previous alternatives, institutional controls would be implemented, such as deed restrictions, to ensure that the future use of the Site is consistent with the assumptions of the BHHRA.

5.3 Groundwater

As discussed in Section 3.4.2, shallow and deep groundwater concentrations exceed ARAR at some lots on Site. Potable and non-potable use of site groundwater, if it were to occur in the future, would pose unacceptable risk to human health. Groundwater use at the Site is unlikely because shallow groundwater is brackish, and the Site and surrounding area are served by the City of Newark's potable water system. Currently, Lots 67, 68, 69 and 70 already have restrictions in place under NJDEP regulations to prevent groundwater use.

As noted in Section 3.7.3, groundwater in some wells contain COC concentrations above ARAR-based PRGs, including several VOCs, SVOCs, and lead.

The remaining technologies and process options for groundwater containing COCs include the following (Section 4.3):

GRA	Remedial Technology	Process Options
No action	Not applicable	Not applicable
Institutional controls/access	Use restrictions	CEA
		WRA
Restrictions	Barriers	Fencing/signs
Engineering controls	Subsurface barriers	Slurry walls
		Sheet piling
Treatment	In-situ (biological)	Bioremediation
	In-situ (physical)	Biosparging
		Immobilization
	In-situ (chemical)	Air sparging
		In-situ chemical oxidation
MNA	Monitoring	In-situ chemical reduction
		Not applicable
		Not applicable
Disposal	Disposal (off-site)	Discharge to local POTW
	Disposal (on-site)	Discharge to surface water

Based on the remaining GRAs and process options, there are two decisions to be made for groundwater at the Site:

- whether or not to take action; and
- if action occurs, whether to pursue limited, passive remedies, or active remedies.

Secondary decisions must also be made regarding the specific types of limited actions and treatment/disposal methods. Where multiple process options are available within a class of response actions (such as in-situ treatment) and the options are expected to have similar effectiveness and protectiveness, the more common and/or less costly method was selected for inclusion as part of a remedial alternative. Should such an alternative be selected for the site remedy, site-specific bench and/or pilot studies may be appropriate to determine the most cost-effective process option. These choices are considered in developing the alternatives and are based on the magnitude of COC concentrations above human health-based and ARAR-based cleanup levels, the quantity of affected material, and the potential for additional aquifer degradation due to cross-media effects from soil. RAOs include reduction of contaminant concentrations and restoration of groundwater quality, mitigating exposure to and migration of groundwater containing COCs, and preventing or minimizing discharge of groundwater containing COCs to surface water. As previously discussed, hypothetical future potable and non-potable use of shallow and deep groundwater site-wide has been determined to present unacceptable health risks. Groundwater use at the Site is unlikely because shallow groundwater is brackish, and the Site and surrounding area are served by the City of Newark's potable water system. Furthermore, Lots 67, 68, 69 and 70 have restrictions in place to prevent groundwater use. CEAs are proposed for two additional areas (Section 2.3.16). As discussed in Section 4.2.3, ex-situ (pump and treat) remedies are deemed to have limited benefit relative to the cost of implementation, and as such are not included among the potential remedial alternatives.

5.3.1 Groundwater Alternative 1 – No Action

Under this alternative, no action would be taken to reduce the potential for unacceptable exposures of humans to impacted groundwater or minimize further aquifer degradation. Existing NJDEP-approved institutional and engineering controls would remain intact. This alternative is retained for comparison with the other alternatives as required by the NCP.

5.3.2 Groundwater Alternative 2 – Institutional Controls

Groundwater Alternative 2 includes maintaining the existing CEAs and WRAs which have already been designated for portions of the Site and designating additional CEAs and WRAs for the remainder of the Site. The CEAs provide notice that groundwater in the area does not meet designated use requirements, and the WRAs prohibit the installation and use of wells for potable and other uses within the designated area. Periodic monitoring and reporting to demonstrate compliance with the restrictions would be required.

These controls may also be included as part of other remedial alternatives in order to provide protectiveness during implementation of those alternatives.

5.3.3 Groundwater Alternative 3 – Institutional Controls and Monitored Natural Attenuation

This alternative combines the CEA and WRA components of Groundwater Alternative 2 with the natural degradation of COCs in the aquifer by natural biological, chemical, and/or physical processes. An assessment of the potential occurrence of MNA processes was not conducted as part of the RI. As indicated by RI results, in general groundwater quality improved between RI Phases 1 and 2. For chlorinated VOCs, concentrations for PCE and its degradation products have decreased substantially, providing evidence of the potential occurrence of natural attenuation processes. Additionally, dissolved oxygen and redox potential field measurements, the presence of abundant iron and manganese, and decreasing concentrations downgradient of the Lot 64 UST area are suggestive of natural anaerobic biodegradation of BTEX compounds.

Groundwater monitoring focused on MNA processes during the remedial design is included in this alternative. Ongoing groundwater monitoring would be performed to confirm that these natural processes are occurring, and that this alternative continues to be protective of human health and the environment. As part of the monitoring program, the installation of additional groundwater monitoring wells may be appropriate. If NAPLs are observed in Site groundwater, then MNA would not apply to NAPL within that area.

5.3.4 Groundwater Alternative 4 – Institutional Controls and Containment

This alternative combines the CEA and WRA components of Groundwater Alternative 2 with engineering controls to isolate contaminated groundwater from the environment and reduce potential hydraulic communication with off-site surface water. Sheet piling or slurry walls constructed to the top of an underlying confining layer, most likely the glacial lake bottom silt deposits starting between 20 and 40 feet below grade, would be used to reduce lateral migration. Additionally, unpaved portions of the Site would be covered with a single-layer impermeable cap, and existing paved areas would remain intact to reduce the likelihood of infiltration of precipitation and flood water from causing a buildup of water within the containment area, which could require pumping and ex-situ treatment were it to occur. Appropriate deed restrictions would be implemented to prevent disturbance of the cap and vertical barrier. This alternative would be implemented for the entire Site. This alternative does not eliminate the need for institutional controls or reduce the expected duration of the controls.

5.3.5 Groundwater Alternative 5 – Institutional Controls and In-Situ Remediation

Alternative 5 includes the CEA and WRA components described for Groundwater Alternative 2. Additionally, impacted groundwater would be subject to in-situ remediation. The objective of this alternative would be to reduce COC concentrations in groundwater, eventually restoring groundwater quality.

The lateral extent of the remedial effort would depend on the cleanup goals for the aquifer and whether the effort would be a “hot-spot” treatment (including the UST excavation water and areas where measurable NAPLs in groundwater are observed) combined with MNA (Groundwater Alternative 3), or a broader effort to treat groundwater containing COCs above PRGs. Considering that COCs include inorganic constituents which are largely associated with soil/fill and tend to be less amenable to in-situ remediation efforts, and that treatment of relatively low concentrations away from the hot-spot areas would be extremely inefficient, a target approach focused on the UST area (in conjunction with a waste alternative) is assumed for this alternative. USTs and LNAPL-impacted soil are addressed in waste and soil alternatives, respectively.

For organic COCs, the most likely in-situ treatment methods include in-situ chemical treatment, biosparging, and air sparging. Pilot- and bench-scale testing would be required as part of the remedial design to determine the most appropriate treatment approach and reagents for site groundwater. However, tidal influences and brackish water quality effects on in-situ treatment may limit effectiveness and may need to be assessed.

Metal COCs in groundwater are not suitable for in-situ remediation because of their ubiquitous presence in historic fill. As described in the RIR (RIR Section 7), fill material is present in surface and subsurface soils throughout the Site. This material is considered “historic fill” as it complies with the NJDEP definition of historic fill. Allocation of impacts due to natural conditions, pre-placement of contaminated fill, or a release(s) was not an RI objective. Metal COCs would be addressed via institutional controls listed in Groundwater Alternative 2. This alternative does not eliminate the need for institutional controls or reduce their expected duration.

5.4 Sewer Water

As discussed in Sections 3.5 and 3.7, wastes (sewer water and solids) in an inactive portion of the northern sewer line (Manhole 8) on Lot 1 are wastes. Manhole 8 measures approximately 4 feet by 4 feet in plan and approximately 6 feet

deep. Nine 4-inch diameter steel pipe terminations were identified in Manhole 8, only one of which was not blocked. Approximately 1.2 feet of sewer water and sediment were present within the base of the manhole during sampling events in March and December 2018, or approximately 0.75 CY of combined water and solids. The water sample had methylene chloride and TCE above groundwater PALs. Methylene chloride and toluene concentrations were above 1 mg/kg, and TCE was reported at a concentration of 26 µg/kg in the solids sample.

Retained GRAs for sewer water and solids are no action and removal with off-site disposal. Retained process options are proven and readily implemented and would likely be implemented on a site-wide basis.

GRA	Remedial Technology	Process Options
No action	Not applicable	Not applicable
Removal	Mechanical transfer	Containerization or transport vehicle
		Pumped
Disposal	Disposal (off-site)	Discharge to local POTW
		Disposal to off-site TSD facility

Based on the remaining GRAs and process options, there are two decisions to be made for sewer water and solids:

- whether or not to take action; and
- if action occurs, what means should be used to remove and dispose of the materials.

As discussed in Section 3.8, approximately 0.4 CY of VOC-impacted sewer water and solids in an inactive portion of the northern sewer line at Manhole 8 on Lot 1 are potential source materials. Although the risks associated with these materials have not been quantified, the RAOs include preventing exposure to a release of the materials, reducing COC concentrations in the water, and preventing or minimizing the discharge of sewer water COCs to surface water. Note that the solids are considered a waste, but for the purposes of this FS, those solids are addressed with the sewer water, as they are collocated.

5.4.1 Sewer Water Alternative 1 – No Action

Under this alternative, no action would be taken. This alternative is retained for comparison with the other alternatives as required by the NCP. Under no action, the water and solids in the designated section of sewer and associated line would be left in place, and no means of securing the materials to prevent future release to the environment would be implemented.

5.4.2 Sewer Water Alternative 2 – Removal and Off-Site Disposal

This alternative consists of the transfer of the water and solids into appropriate containers or transport vehicles for off-site treatment and/or disposal. The means for disposal of the various wastes would be determined during the remedial design; however, for the purposes of this FS, certain assumptions can be made, pending disposal characterization. Liquid materials would be pumped into drums and transferred to an appropriate facility for treatment and disposal. Remaining solids in the manhole would be vacuumed into a drum and disposed of in an appropriate solid waste landfill.

Upon removal of the contents, the interior of the manhole and associated line would be water-jetted, and then closed in place by plugging/filling so as to prevent future buildup of additional water and solids in the manhole. Cleaning of the manhole and the one unplugged pipe would generate an estimated 300 gallons of liquids, in addition to the approximately 80 gallons of liquids currently in the sewer and 0.4 CY of solids.

5.5 Soil Gas

As indicated in the BHHRA, risks to future indoor workers from soil gas intrusion are unacceptable at Lots 58 (TCE and xylenes), 62 (naphthalene), and 68 (TCE and xylenes). It is assumed that soil gas concentrations are relatively consistent within each of the areas delineated for soil vapor COCs as provided in Section 3.8. Accordingly, the areas identified for Lots 58, 62, and 68 VOCs in soils are the same for soil gas delineation.

Retained GRAs, remedial technologies, and process options for soil gas are listed below:

GRA	Remedial Technology	Process Options
No action	Not applicable	Not applicable
Institutional controls	Use restrictions	Deed notice CEA
Engineering controls	Subsurface barriers	Vapor barrier
Removal	SSDS	Active SSDS
Treatment	Ex-situ treatment (physical)	Immobilization/adsorption Photocatalytic oxidation

Based on indoor air sample results, health risks posed by indoor vapors in currently occupied buildings are below applicable risk thresholds. Risk assessment results indicate that vapor barriers and/or passive depressurization systems may be required for future indoor workers at Lots 58, 62, and 68, should structures be occupied or built on those lots. Retained process options are proven and readily implemented and would be implemented on an individual lot basis. The RAO for soil gas is to reduce COC levels in soils to reduce the potential for vapor intrusion.

Based on the remaining GRAs and process options, there are two decisions to be made for soil gas:

- whether or not to take action; and
- if action occurs, whether to pursue limited action, passive remedies or active remedies.

As discussed in Section 2.15, risks to future indoor workers from soil gas intrusion are unacceptable at Lots 58 (TCE and xylenes), 62 (naphthalene), and 68 (TCE and xylenes). Alternatives to directly address the sources of the soil gas, such as through soil excavation or in-situ remediation, are discussed in Section 5.2. The treatment alternatives described in this section relate to the treatment of soil gas COCs after removal from the ground, if such treatment is required to meet ARARs with respect to off-gas emissions.

5.5.1 Soil Gas Alternative 1 – No Action

Under this alternative, no action would be taken. This alternative is retained for comparison with the other alternatives as required by the NCP. Under no action, no measures would be taken to protect future indoor workers from exposure to organic soil vapors. Existing NJDEP-approved institutional and engineering controls would remain intact.

5.5.2 Soil Gas Alternative 2 – Institutional and Engineering Controls

This alternative consists of establishing or enhancing deed notices and/or CEAs on the affected lots to provide certain restrictions upon the use of the property. Such restrictions would require that prior to existing buildings being occupied in the future, a building-specific assessment of sub-slab soil gas and/or indoor air quality would be performed, and if needed, some means of protecting the future occupants of such existing buildings from vapor intrusion risks would be implemented. Additional restrictions would require that future new construction include a vapor barrier or other appropriate means of sealing the ground surface underneath the new building slab. Ongoing indoor air monitoring would be required to ensure the future indoor workers are protected.



5.5.3 Soil Gas Alternative 3 – Sub-Slab Depressurization System

This alternative consists of establishing or enhancing deed notices and/or CEAs on the affected lots to provide certain restrictions upon the use of the property, as described for Soil Gas Alternative 2. In addition, an active SSDS would be installed for each of the existing buildings on the affected lots within the limits of potential vapor intrusion, as determined during the remedial design. A negative pressure field (vacuum) would be applied to the subsurface through a well network beneath and/or around each building using a fan or blower. Depending on the vapor concentrations, off-gas treatment using oxidation or vapor-phase granular activated carbon may be required. Ongoing SSDS operational monitoring and indoor air monitoring would be required to ensure the future indoor workers are protected.

5.6 Screening of Alternatives

Based on the number of remedial alternatives for each media of interest, all the alternatives are carried forward through the detailed description and evaluation. Screening of remedial action alternatives is not warranted.

6. DETAILED ANALYSIS OF ALTERNATIVES

6.1 Evaluation Criteria

In this section, the alternatives developed in Section 5 for various media at the site are described and evaluated in detail. The detailed analysis of alternatives provides information to aid in the comparison among alternatives and the selection of the final recommended alternative. This analysis is performed in accordance with the USEPA RI/FS Guidance Document (USEPA, 1988) and the NCP, as revised by 55 Federal Register 8813 (March 8, 1990). In conformance with the NCP, the following nine criteria are used in the final analysis:

- Overall protection of human health and the environment;
- Compliance with ARARs;
- Long-term effectiveness and permanence;
- Reduction of TMV by treatment;
- Short-term effectiveness;
- Implementability;
- Cost;
- State (support agency) acceptance; and
- Community acceptance.

These criteria are described below, before performing the detailed analysis of the alternatives.

6.1.1 Overall Protection of Human Health and the Environment

Each alternative is assessed to determine whether it can provide adequate protection of human health and the environment (short- and long-term) from unacceptable risks posed by hazardous substances, pollutants, or contaminants present at the Site. Evaluation of this criterion focuses on how site risks are eliminated, reduced, or controlled through treatment, engineered controls, or institutional controls and whether an alternative poses any unacceptable cross-media impacts.

6.1.2 Compliance with ARARs

Section 121(d) of CERCLA, 42 U.S. Code § 9621(d), the NCP, 40 CFR Part 300 (1990), and guidance and policy issued by USEPA require that remedial actions under CERCLA comply with substantive provisions of ARARs from the state and federal environmental laws and State facility siting laws during and at the completion of the remedial action, unless such ARARs are waived. The definition and identification of ARARs have been described and discussed in detail in Section 3.2. Three classifications of requirements are defined by USEPA in the ARAR determination process. ARARs are defined as chemical-, location-, or action-specific. An ARAR can be one or a combination of all three types. Each alternative is evaluated to determine how chemical- and action-specific ARARs would be met.

6.1.3 Long-Term Effectiveness and Permanence

Long-term effectiveness evaluates the likelihood that the remedy would be successful and the permanence it affords. Factors TBC, as appropriate, are discussed below.

- Magnitude of residual risk remaining from untreated waste or treatment residuals remaining at the end of the remedial activities. The characteristics of the residuals are considered to the degree that they remain hazardous, taking into account their TMV and, where relevant, propensity to bioaccumulate.
- Adequacy and reliability of controls used to manage treatment residuals and untreated waste remaining at the Site. This factor includes an assessment of containment systems and institutional controls to determine if they are sufficient to ensure any exposure to human and ecological receptors is within protective levels. This factor also addresses the long-term reliability of management controls for providing continued protection from residuals, the assessment of the potential need to replace technical components of the alternative, and the potential exposure pathways and risks posed should the remedial action need replacement.

6.1.4 Reduction of Toxicity, Mobility, or Volume by Treatment

Each alternative is assessed for the degree to which it employs a technology to permanently and significantly reduce TMV, including how treatment is used to address the principal threats posed by the site. Factors TBC, as appropriate, include the items below.

- The treatment processes the alternatives employ and materials they would treat
- The amount of hazardous substances, pollutants, or contaminants that would be destroyed or treated, including how the principal threat(s) would be addressed
- The degree of expected reduction in TMV of the waste due to treatment
- The degree to which the treatment is irreversible
- The type and quantity of residuals that would remain following treatment, considering the persistence, toxicity, mobility, and propensity to bioaccumulate such hazardous substances and their constituents
- Whether the alternative would satisfy the statutory preference for treatment as a principal element of the remedial action

6.1.5 Short-Term Effectiveness

This criterion reviews the effects of each alternative during the construction and implementation phase of the remedial action until remedial response objectives are met. The short-term impacts of each alternative are assessed, considering the following factors, as appropriate.

- Short-term risks that might be posed to the community during implementation of an alternative
- Potential impacts on workers during remedial action and the effectiveness and reliability of protective measures
- Potential adverse environmental impacts resulting from construction and implementation of an alternative and the reliability of the available mitigation measures during implementation in preventing or reducing the potential impacts

- Time until protection is achieved for either the entire site or individual elements associated with specific site areas or threats

6.1.6 Implementability

The technical and administrative feasibility of implementing an alternative and the availability of various services and materials required during its implementation is evaluated under this criterion. The ease or difficulty of implementing each alternative is assessed by considering the following factors:

Technical Feasibility

- Technical difficulties and unknowns associated with the construction and operation of a technology
- Reliability of the technology, focusing on technical problems that will lead to schedule delays
- Ease of undertaking additional remedial actions, including what, if any, future remedial actions would be needed and the difficulty to implement additional remedial actions

Administrative Feasibility

- Activities needed to coordinate with other offices and agencies and the ability and time required to obtain any necessary approvals and permits from other agencies (for off-site actions)

Availability of Services and Materials

- Availability of adequate off-site treatment, storage capacity, and disposal capacity and services
- Availability of necessary equipment and specialists and provisions to ensure any necessary additional resources

6.1.7 Cost

Detailed cost estimates for each alternative were developed for the FS according to A Guide to Developing and Documenting Cost Estimates during the Feasibility Study (USEPA, 2000), with an expected accuracy of -30 to +50 percent. Costs are based on published unit rates, such as R.S. Means, recent actual cost data and supplier quotes for other projects of a similar nature, and professional judgement. A contingency of 25 percent is added to the cost estimates to account for possible variations in scope and quantities. Detailed cost estimates for the alternatives are included in Appendix B and include the following:

- Capital costs
- Annual O&M costs
- Periodic costs
- Present value of capital and annual O&M costs, based on a 3 percent annual discount rate for future costs

6.1.8 State (Support Agency) Acceptance

State (support agency) acceptance is a modifying criterion under the NCP. Assessment of state acceptance will not be completed until comments on the final FS report are submitted to USEPA. Thus, state acceptance is not considered in the detailed analysis of alternatives presented in the FS.

6.1.9 Community Acceptance

Community acceptance is also a modifying criterion under the NCP. Assessment of community acceptance will include responses to questions that any interested person in the community may have regarding any component of the remedial alternatives presented in the final FS report. This assessment will be completed after USEPA receives public comments on the proposed plan during the public comment period. Thus, community acceptance is not considered in the detailed analysis of alternatives presented in the FS.

6.2 Individual Analysis of Alternatives

This section provides the detailed analysis for each remedial alternative developed in Section 5. Detailed cost estimates were generated for each alternative and are summarized in Table 6-1. The cost estimates encompass the capital, construction, and long-term maintenance costs incurred over the life of the remedy (30 years) expressed as the net present value of these costs. Detailed estimated cost tables are included in Appendix B. Note that although the five-year reviews required by the NCP will cover all site media, the costs for performing these reviews have been included only in the estimates for the waste alternatives.

6.2.1 Wastes

6.2.1.1 Waste Alternative 1 – No Action

Overall Protection of Human Health and the Environment

The No Action alternative would not provide protection of human health and the environment since no action would be taken to remove the containerized waste and LNAPLs in USTs and Building #15A. This alternative would not meet the RAOs.

Compliance with ARARs

This alternative would not comply with New Jersey UST regulations.

Long-Term Effectiveness and Permanence

The No Action alternative does not provide long-term effectiveness and permanence since the contaminated wastes would not be addressed. There would be no change to the magnitude of potential impacts since no action would be taken to reduce or remove the materials. The No Action alternative provides no controls of the materials nor any measures to control potential human health risks and ecological risks. The No Action alternative would not provide any mechanism to monitor the potential release of the materials.

Reduction of TMV through Treatment

No reductions of contaminant TMV through treatment would be achieved under this alternative. There is no provision in this alternative to remove waste.

Short-Term Effectiveness

Since no remedial action would be implemented, this alternative would not pose a short-term impact to on-site workers or the local community.

Implementability

An evaluation of the implementability of the no-action alternative is not applicable, as no action is taken.

Cost

The no-action alternative has no capital costs over the 30-year project life, and would incur only costs related to the five-year reviews required by the NCP, estimated to have a net present value of \$98,000, as detailed in Appendix B.

6.2.1.2 Waste Alternative 2 – Removal and Off-Site Disposal

This alternative includes the removal and appropriate disposal of waste from containers, Building #15A and the USTs, as well as the removal and disposal of the USTs and associated impacted soil in accordance with state UST tank closure regulations and technical guidance.

Overall Protection of Human Health and the Environment

This alternative would provide protection of human health and the environment, as the wastes would be removed from the Site, thereby eliminating the potential for exposure of human and ecological receptors and release of the materials to environmental media.

Compliance with ARARs

This alternative would comply with New Jersey UST regulations. Location- and action-specific ARARs would be met by following appropriate health and safety requirements and complying with necessary regulations and permits, including disposal of removed wastes at an authorized off-site TSD facility. This alternative would meet chemical-specific ARARs (PRGs) since the wastes would be removed from the Site.

Long-Term Effectiveness and Permanence

This alternative would provide long-term effectiveness and permanence by removal of the waste. The magnitude of the residual risk would be minimal, and no wastes requiring continuing controls would remain.

Reduction of TMV through Treatment

This alternative would reduce the mobility of the waste through removal and appropriate off-Site disposal. The toxicity and volume of the waste would not be affected by treatment.

Short-Term Effectiveness

This alternative would involve approximately 2 to 4 weeks of on-site construction operations, which would increase local traffic due to the commute of construction workers, transportation of construction equipment, shipment of waste containers, and importing of backfill materials. Protection of the workers and the surrounding environment and community during implementation of this remedy can be achieved by adhering to Occupational Safety and Health Administration (OSHA) standards for construction and hazardous waste work.

Implementability

Removal of the wastes and USTs is readily implementable, as equipment and experienced vendors for this type of work are available. Groundwater in excavation area will be managed during UST removal.

Cost

The capital cost for this alternative is \$589,600. The annual O&M cost, which is primarily related to performance of five-year reviews, is \$6,250. The present worth cost of this alternative is \$712,000 for 30 years.

6.2.2 Soil/Fill

6.2.2.1 Soil/Fill Alternative 1 – No Action

Overall Protection of Human Health and the Environment

The No Action alternative would not provide protection of human health and the environment since no action would be taken to reduce contaminant mass and to restore the impacted areas. Potential risks to workers, visitors, and trespassers, as identified in the BHHRA, would remain. This alternative would not address the RAOs.

Compliance with ARARs

This alternative would not comply with chemical-specific ARARs, as no action would be taken to address soils with COC concentrations above relevant standards.

Long-Term Effectiveness and Permanence

The No Action alternative does not provide long-term effectiveness and permanence since the contaminated soils, including LNAPL where present, would not be addressed. There would be no change to the magnitude of residual contamination since no action would be taken to reduce or remove the contaminants. The No Action alternative provides no controls nor any measures to control potential human health risks and ecological risks associated with the impacted soils, and would not provide any mechanism to monitor the potential migration of the impacted soils.

Reduction of TMV through Treatment

No reductions of contaminant TMV through treatment would be achieved under this alternative. There is no provision in this alternative to address impacted soils. However, natural biological, chemical, and physical processes may gradually reduce concentrations of certain COCs, although not as quickly as a treatment option.

Short-Term Effectiveness

Since no remedial action would be implemented, this alternative would not pose a short-term impact to on-site workers or the local community.

Implementability

An evaluation of the implementability of the no-action alternative is not applicable, as no action is taken.

Cost

The No Action alternative has no capital costs over the 30-year project life, and five-year review costs are included in the Waste Alternative 1 cost estimates. Thus, this alternative has no present value.

6.2.2.2 Soil/Fill Alternative 2 – Institutional Controls and Limited Action

For this alternative, deed notices would be recorded on all 15 lots. Existing deed notices would be revised to reflect RI results and implemented engineering controls for applicable lots. Fencing would be maintained and enhanced as appropriate in order to limit unauthorized access to the area and prohibit future use of the area in a manner which may expose human receptors to unacceptable risk.

Overall Protection of Human Health and the Environment

Through the recording and maintenance of deed notices, zoning ordinances, and access restrictions as described in Section 5.2.2, including fencing and requirements for new construction, this alternative would be protective of human health by addressing human exposure pathways, but would not address ecological exposure pathways, nor would it prevent or minimize potential off-site transport of soil containing COCs or the potential leaching of COCs to groundwater and surface water.

Compliance with ARARs

This alternative would not comply with chemical-specific ARARs, as no action would be taken to address soils with COC concentrations above relevant standards. This alternative would not be in compliance with required remedial action related to historic fill pursuant to N.J.A.C. 7:26E-5.4 and to N.J.A.C. 7:26C-7.

Long-Term Effectiveness and Permanence

Deed restrictions effectively prevent unauthorized land use and development by future owners of the property in a manner inconsistent with use assumptions of the BHHRA. Fencing reduces unauthorized on-site activities and human exposure to COPCs in soil and fill material.

Regular site inspections would be required to confirm and document continued compliance with the deed and access restrictions. This alternative provides no controls nor any measures to control potential and ecological risks associated with COCs in soils, and would not provide any mechanism to monitor the potential migration of the COPCs in soils.

Reduction of TMV through Treatment

No reductions of contaminant TMV through treatment would be achieved under this alternative. There is no provision in this alternative to address COCs in soils. However, natural biological, chemical, and physical processes may gradually reduce concentrations of certain COCs, although not as quickly as an active treatment option.

Short-Term Effectiveness

Since no on-site remedial action would be implemented, other than fence installation, this alternative would pose limited short-term impact to on-site workers or the local community.

Implementability

This alternative would be easily implemented. Property owners would need to record their deed notice. Regular inspections would be required to verify continued integrity of the fencing and compliance with deed restrictions.

Cost

The capital cost for this alternative is \$134,300. The annual O&M cost, which is primarily related to performance of routine site inspections, is \$1,250. The present worth cost of this alternative is \$159,000 for 30 years.

6.2.2.3 Soil/Fill Alternative 3 – Engineering and Institutional Controls

For this alternative, in addition to the deed restriction and fencing activities described for Soil/Fill Alternative 2, a 6-inch asphalt cap would be installed over soils containing COCs on 11 of the site lots. In addition, portions of the river shoreline with either no bulkhead or an existing failing bulkhead would be addressed by the installation of either new steel sheet piling or installation of a liner and riprap to reduce the potential interaction between surface water and the Site.

Overall Protection of Human Health and the Environment

Through the recording and maintenance of deed notices and access restrictions as described in Section 5.2.2, fencing and requirements for new construction, and the installation of a surface cap and enhancement of the existing bulkhead along the river, this alternative would be protective of human health and the environment. These actions would address human exposure human and ecological pathways to COCs and COECs, minimize the potential for interaction between the Site and the surface water, and reduce the potential for leaching of COCs to groundwater and surface water.

Compliance with ARARs

This alternative would meet PRGs (chemical-specific ARARs) because contaminated soils exceeding PRGs would be capped.

This alternative would be in compliance with required remedial action related to historic fill pursuant to N.J.A.C. 7:26E-5.4 and to N.J.A.C. 7:26C-7. Location- and action-specific ARARs would be met by following appropriate health and safety requirements and complying with necessary regulations and permits, including erosion and sedimentation regulations and storm water management. Institutional controls would need to be implemented and monitored.

Long-Term Effectiveness and Permanence

Deed restrictions, fencing, and appropriate risk management practices would effectively prevent unauthorized activities and development by future owners of the property in a manner inconsistent with use assumptions of the BHHRA and the asphalt cap would effectively reduce human and ecological exposures. The bulkhead enhancements would both reduce off-site soil movement. Inactive wall pipes would be sealed, eliminating this potential pathway. Some lots have existing asphalt caps via deed notices or concrete/asphalt pavement that could provide comparable long-term effectiveness and permanence as a new cap. During remedial design, these existing features will be assessed. Regular site inspections would be required to confirm and document continued compliance with the deed and access restrictions. Regular inspections and as-needed maintenance of the cap and enhanced bulkhead would be required to ensure those controls continue to be protective as intended over their anticipated design life.

Reduction of TMV through Treatment

No reductions of contaminant TMV through treatment would be achieved under this alternative, as there is no provision in this alternative to directly address COCs in soils. However, natural biological, chemical, and physical processes may gradually reduce concentrations of certain COCs. Mobility of soil COCs would be reduced through installation of the cap and bulkhead enhancement.

Short-Term Effectiveness

This alternative would involve approximately 4 to 8 months of on-site construction operations, which would increase local traffic due to the commute of construction workers, transportation of large construction equipment, and importing of materials. Construction would generate noise during the day, particularly with respect to installation of the steel bulkhead sections. Bulkhead enhancement and capping of soils at the Site will require coordination with existing operations on certain lots.

Implementability

This alternative is implementable. Equipment and experienced contractors for cap installation are readily available. Construction of the cap would require coordination with existing businesses and anticipated redevelopment plans, if available at the time of remedial design. For the bulkhead enhancement, administrative coordination with the U.S. Corps of Engineers, NJDEP, and USEPA would be required, and the limited space between the shoreline and existing

site buildings may present a technical challenge. A geotechnical investigation during design of bulkhead enhancement would likely be required. The northern portion of the Site is congested with ongoing business activities and also provides the only vehicle access point. This alternative will cause disturbances to current businesses. Deed notices would be recorded by each property owner.

A specialty contractor would be required for installation of the enhanced bulkhead sections, using either land-based or water-based equipment. Regular inspections would be required to verify continued integrity of the fencing and compliance with deed restrictions, and to verify integrity of the cap and bulkhead. Inspection and maintenance of the bulkhead, in particular, may be challenging.

Cost

The capital cost for this alternative is \$3,670,300 if the bulkhead is enhanced with new sheet piling, and \$2,172,200 if riprap is used to anchor portions of the shoreline. The annual O&M cost, which is primarily related to performance of routine site inspections and maintenance, including occasional cap resurfacing, is \$46,900 to 53,100. The present worth cost of this alternative is \$4,589,000 (sheet pile) or \$3,213,000 (riprap) for 30 years.

6.2.2.4 Soil/Fill Alternative 4 – Excavation and Off-Site Disposal

For this alternative, select soils above the water table with COC concentrations above PRGs would be excavated and disposed off Site. Remedial design sampling will refine excavation areas and depths. Excavated areas would be backfilled and finished in a manner consistent with current conditions or as otherwise appropriate for subsequent site redevelopment. Lots 67 and 69 would be capped with asphalt to address potential ecological exposures. Additionally, the institutional controls described for Soil/Fill Alternative 2 would also be implemented.

Overall Protection of Human Health and the Environment

This alternative would be protective of human health and the environment, although it does not prevent or minimize potential off-site transport of soil containing COCs. Removal of surface soil containing COCs prevents potential off-site transport of soil containing COCs. The exposure pathways to human and ecological receptors would be reduced by removal of COCs in soil/fill exceeding the PRGs from the Site. Capping of Lots 67 and 69 would eliminate ecological exposures to soils with COEC. Removal and replacement of surface soil at other lots would also eliminate or minimize ecological exposure pathways to COECs in surface soil/fill.

Compliance with ARARs

By removal and appropriate off-site disposal of soils exceeding the established PRGs, this alternative would comply with chemical-specific ARARs for COCs in soils above the water table, but could require a waiver of ARARs for COCs in soils below the water table. Capping of Lots 67 and 69 would meet PRGs.

Location- and action-specific ARARs would be met by following appropriate health and safety requirements and complying with all necessary regulations and permits, including erosion and sedimentation regulations and storm water management. Based on backfill used, this alternative may not be in compliance with required remedial action related to historic fill pursuant to N.J.A.C. 7:26E-5.4 and to N.J.A.C. 7:26C-7. Institutional controls would need to be implemented and monitored.

Long-Term Effectiveness and Permanence

This alternative would provide long-term effectiveness and permanence by removal of the COCs in soils above the water table. The residual risk is reduced but remains as soils with COCs above PRGs remain below the water table. Routine inspections of backfilled areas and correction of erosion or other issues would be performed.

Reduction of TMV through Treatment

This alternative would reduce the mobility of the soil COCs through removal and appropriate off-site disposal, most likely by landfilling. The toxicity and volume of the waste would not be reduced.

Short-Term Effectiveness

This alternative would involve approximately 4 to 7 months of on-site construction operations, which would increase local traffic due to the commute of construction workers, transportation of construction equipment, shipment of waste containers, and importing of backfill materials. Protection of the workers and the surrounding environment and community during excavation of impacted soils can be achieved by adhering to OSHA standards for construction and hazardous waste work, including air monitoring and dust control measures.

Implementability

Soil excavation, loading, and hauling is readily implemented with common earthmoving equipment, and other requisite services, including backfill material and disposal facilities, are anticipated to be readily available. The ability to conduct deeper excavations, such as for TCE on Lot 58, may be limited by the proximity to building foundations. Remedial activities would be coordinated with ongoing commercial activities at the Site. Excavation and associated soil/fill management would disrupt existing business. The northern portion of the Site is congested with ongoing business activities and also provides the only vehicle access point. This alternative will cause disturbances to current businesses. Owner would record deed notices.

Cost

The capital cost for this alternative is \$5,499,100. The annual O&M cost, which is primarily related to performance of routine inspections, is \$12,500. The present worth cost of this alternative is \$5,744,000 for 30 years.

6.2.2.5 Soil/Fill Alternative 5 – Hot Spot Excavation and Capping

For this alternative, select hot spot soils above the water table on Lots 63 and 64 would be excavated and disposed off Site. Remedial design sampling will refine excavation areas and depths. Excavated areas would be backfilled and finished in a manner consistent with current conditions or as otherwise appropriate for subsequent site redevelopment. In addition, 6-inch asphalt cap would be installed over identified soils on 11 of the site lots (refer to Soil/Fill Alternative 3), including Lots 67 and 69. Additionally, the institutional controls described for Soil/Fill Alternative 2 would also be implemented.

Overall Protection of Human Health and the Environment

This alternative would be protective of human health and the environment, although it does not address the potential for interaction between the Site and surface water. Removal of surface soil from Lots 63 and 64 would minimize potential off-site transport of soil containing COCs. The exposure pathways to human and ecological receptors would be reduced by removal of lead above PRGs on Lots 63 and 64, and capping of soils on other lots. These actions would also reduce the potential for leaching of COCs to groundwater and surface water.

Compliance with ARARs

This alternative would meet PRGs (chemical-specific ARARs) since the contaminated soils exceeding PRGs would be excavated or capped.

Location- and action-specific ARARs would be met by following appropriate health and safety requirements and complying with all necessary regulations and permits, including erosion and sedimentation regulations and storm water management. This alternative would be in compliance with required remedial action related to historic fill pursuant to N.J.A.C. 7:26E-5.4 and to N.J.A.C. 7:26C-7. Institutional controls would need to be implemented and monitored.

Long-Term Effectiveness and Permanence

This alternative would provide long-term effectiveness and permanence by removal of the lead in soils above the water table on Lots 63 and 64, as well as the LNAPL-containing soils on those lots. For the remaining lots, deed restrictions, fencing, and appropriate risk management practices would effectively prevent unauthorized activities and development by future owners of the property in a manner inconsistent with use assumptions of the BHHRA and the asphalt cap would effectively reduce human and ecological exposures. Some lots have existing asphalt caps via deed notices or concrete/asphalt pavement that could provide comparable long-term effectiveness and permanence as an engineering control cap. During remedial design, these existing features will be assessed. Regular site inspections would be required to confirm and document continued compliance with the deed and access restrictions, along with regular inspections and as-needed maintenance of the cap.

Reduction of TMV through Treatment

This alternative would reduce the mobility of the soil COCs through removal and appropriate off-site disposal, most likely by landfilling, of hot spot and LNAPL-containing soils on Lots 63 and 64. The toxicity and volume of the waste would not be reduced.

Short-Term Effectiveness

This alternative would involve approximately 4 to 7 months of on-site construction operations, which would increase local traffic due to the commute of construction workers, transportation of construction equipment, shipment of waste containers, and importing of backfill materials. Protection of the workers and the surrounding environment and community during excavation of impacted soils can be achieved by adhering to OSHA standards for construction and hazardous waste work, including air monitoring and dust control measures.

Implementability

Soil excavation, loading, and hauling, and asphalt cap installation is readily implemented with common earthmoving equipment, and other requisite services, including backfill material and disposal facilities, are anticipated to be readily available. Remedial activities would be coordinated with ongoing commercial activities at the Site. Excavation and associated soil/fill management and capping would disrupt existing business. The northern portion of the Site is congested with ongoing business activities and also provides the only vehicle access point. This alternative will cause disturbances to current businesses. Property owners would record deed notices.

Cost

The capital cost for this alternative is \$2,015,000. The annual O&M cost, which is primarily related to performance of routine inspections, is \$53,100. The present worth cost of this alternative is \$3,056,000 for 30 years.

6.2.2.6 Soil/Fill Alternative 6 – In-Situ Treatment

For this alternative, selected soils above the water table with metals above PRGs would be subject to in-situ stabilization in order to bind the metals to the soil matrix. Selected soils with VOCs above PRGs would be subject to soil mixing with a chemical oxidant to destroy the VOCs. A single-layer asphalt cap (as described for Soil/Fill Alternative 3) would be installed over the treated areas as well as Lots 67 and 69, and the institutional controls described for Soil/Fill Alternative 2 would also be implemented.

Overall Protection of Human Health and the Environment

This alternative would be protective of human health and the environment, although it does not address the potential for interaction between the Site and surface water. Treatment of surface soil from Lots 63 and 64 would minimize potential off-site transport of soil containing COCs. The exposure pathways to human and ecological receptors would be eliminated by capping and treatment of soils above the water table with COCs exceeding the PRGs from the Site. COCs below the water table remain. Potential transport of COCs in soil off Site and potential leaching of COCs to groundwater and surface water would also be reduced.

Compliance with ARARs

By treatment of COCs in soils above the water table exceeding the established PRGs, this alternative would comply with some chemical-specific ARARs for COCs in soils above the water table through destruction of VOCs but would require a waiver of ARARs for COCs in soils below the water table that are not capped. Areas capped under this alternative would meet PRGs (chemical-specific ARARs). Metals concentrations exceeding PRGs would remain, but the metals would be immobilized and capped. Location- and action-specific ARARs would be met by following appropriate health and safety requirements and complying with all necessary regulations and permits, including erosion and sedimentation regulations and storm water management. This alternative may not be in compliance with required remedial action related to historic fill pursuant to N.J.A.C. 7:26E-5.4 and to N.J.A.C. 7:26C-7. Institutional controls would need to be implemented and monitored.

Long-Term Effectiveness and Permanence

This alternative would provide long-term effectiveness and permanence by treatment of the COCs in soils to destroy VOCs and immobilize metals. The magnitude of the residual risk would be minimal, although COCs would remain in soils below the water table. Routine inspections of treated and capped areas and correction of erosion or other issues would be performed.

Reduction of TMV through Treatment

This alternative would reduce the mobility of the metals COCs and the toxicity and volume of VOCs through treatment above the water table. COCs below the water table would not be addressed.

Short-Term Effectiveness

This alternative would involve approximately 5 to 8 months of on-site construction operations, which would increase local traffic due to the commute of construction workers, transportation of construction equipment, importing of treatment reagents, and hauling of excess soils. Protection of the workers and the surrounding environment and community during treatment of impacted soils can be achieved by adhering to OSHA standards for construction and hazardous waste work, including air monitoring and dust control measures.

Implementability

This alternative is implementable, requiring owner/tenant cooperation. Equipment, reagents, and experienced vendors for in-situ stabilization and treatment of impacted soils are commercially available. Pilot studies would be required during remedial design to determine the appropriate reagents and mixing ratios to meet PRGs and required leachability treatment criteria. Remedial activities would be coordinated with ongoing commercial activities at the Site. The northern portion of the Site is extremely congested with ongoing business activities and also provides the only vehicle access point. Treatment in the northern portion will cause disturbances to businesses.

Cost

The capital cost for this alternative is \$3,934,400, assuming in-situ stabilization for metals and soil mixing/chemical oxidation for VOCs. Alternate treatment methods are expected to have similar implementation costs. The annual O&M cost, which is primarily related to performance of routine inspections, is \$12,500. The present worth cost of this alternative is \$4,179,000 for 30 years.

6.2.3 Groundwater

6.2.3.1 Groundwater Alternative 1 – No Action

Overall Protection of Human Health and the Environment

The No Action alternative would not provide protection of human health and the environment since no action would be taken to prevent exposure to groundwater at the Site or to prevent or minimize potential discharge to surface water, although at the present time there are no users of groundwater. This alternative would not address the RAOs. Natural processes such as dispersion and degradation may gradually reduce COC concentrations in the aqueous phase; however, no monitoring would be performed to confirm this reduction.

Compliance with ARARs

This alternative would not comply with chemical-specific ARARs, as no action would be taken to address groundwater with COC concentrations above relevant standards.

Long-Term Effectiveness and Permanence

The No Action alternative does not provide long-term effectiveness and permanence since COCs in groundwater would not be addressed. There would be no change to the magnitude of residual contamination since no action would be taken to reduce or remove the contaminants. The No Action alternative provides no controls nor any measures to control potential human health risks and ecological risks associated with the impacted groundwater, and would not provide any mechanism to monitor its potential migration.

Reduction of TMV through Treatment

No reductions of contaminant TMV through treatment would be achieved under this alternative. There is no provision in this alternative to address impacted groundwater. However, natural biological, chemical, and physical processes may continue to gradually reduce concentrations of certain COCs, although not as quickly as a treatment option.

Short-Term Effectiveness

Since no remedial action would be implemented, this alternative would not pose a short-term impact to on-site workers or the local community.

Implementability

An evaluation of the implementability of the No Action alternative is not applicable, as no action is taken.

Cost

The No Action alternative has no capital costs over the 30-year project life, and five-year review costs are included in the Waste alternative estimates. Thus, this alternative has no present value.

6.2.3.2 Groundwater Alternative 2 – Institutional Controls

This alternative includes maintaining the existing CEAs and WRAs which have already been designated for portions of the Site and designating additional CEAs and WRAs for the remainder of the Site. Periodic monitoring and reporting would be performed to demonstrate compliance with the restrictions.

Overall Protection of Human Health and the Environment

Through the maintenance of existing CEAs and WRAs at the Site and designation of additional CEAs and WRAs for the remainder of the Site, this alternative would prevent exposure to COCs in groundwater, but would not reduce COC concentrations, migration of COCs in groundwater, or prevent or minimize potential discharge of groundwater containing COCs to surface water.

Compliance with ARARs

By providing institutional controls restricting the use of groundwater and thereby eliminating the exposure pathway, compliance with action-specific ARARs may be achieved. In the short-term, this alternative may not comply with ARARs calling for the restoration of groundwater.

Long-Term Effectiveness and Permanence

If complied with, groundwater use restrictions in combination with the existing reliable supply of public water available throughout the area would effectively prevent unacceptable human exposure to COCs in groundwater. As the impacted areas would not be remediated by this alternative, it is likely that the use restrictions would be required to remain in effect for an indefinite period. Groundwater monitoring would be performed to confirm the alternative remains effective.

Reduction of TMV through Treatment

Implementation of institutional controls would not reduce the TMV of COCs. However, natural biological, chemical, and physical processes may continue to gradually reduce concentrations of certain substances.

Short-Term Effectiveness

The implementation of this alternative would entail minimal risk of human exposure to COCs in groundwater, with the greatest contribution to this risk resulting from occasional groundwater sampling and the installation of additional monitoring wells as needed. Such risks associated would be minimized by following appropriate health and safety requirements.

Implementability

This alternative would be easily implemented, as certain areas/lots already have these restrictions. Regular inspections would be performed to verify compliance with the requirements of the CEAs and WRAs, and routine groundwater monitoring would be performed.

Cost

The capital cost for this alternative is \$618,500. The annual O&M cost, which is primarily related to performance of routine site inspections and groundwater monitoring, is \$81,300. The present worth cost of this alternative is \$2,211,000 for 30 years.

6.2.3.3 Groundwater Alternative 3 – Institutional Controls and Monitored Natural Attenuation

This alternative combines the CEA and WRA components of Groundwater Alternative 2 with the natural degradation of COCs in the aquifer by natural biological, chemical, and/or physical processes. Ongoing groundwater monitoring would be performed to demonstrate that these natural processes are occurring, and that the selected remedy continues to be protective of human health and the environment.

Overall Protection of Human Health and the Environment

Through the maintenance of existing CEAs and WRAs at the Site and designation of additional CEAs and WRAs for the remainder of the Site, this alternative would prevent exposure to COCs in groundwater, and reduce COC concentrations and migration of COCs in groundwater associated with biodegradation. This on-site attenuation reduces potential for discharges of groundwater containing COCs to surface water. Metal COC attenuation in groundwater is primarily due to retardation and adsorption. Additionally, groundwater monitoring would be conducted to support the demonstration of the occurrence of natural attenuation processes such to gradually reduce COC concentrations in the aqueous phase.

Compliance with ARARs

By providing institutional controls restricting the use of groundwater and thereby eliminating the exposure pathway, compliance with action-specific ARARs may be achieved. In the short-term, this alternative may not comply with chemical-specific ARARs (PRGs) associated with the restoration of groundwater, however, over time natural attenuation processes may eventually reduce COC concentrations to meet certain chemical-specific ARARs. Groundwater results during the RI indicated groundwater quality improvement resulting in ARAR compliance for some VOCs. Metal COC concentrations in groundwater may not be reduced to below PRGs for a long period. Other alternatives including waste removal and capping or excavation of contaminated soil will reduce potential COC infiltration into groundwater from unsaturated soils. Groundwater would be monitored until PRGs for COCs are met.

Long-Term Effectiveness and Permanence

If complied with, groundwater use restrictions in combination with the existing reliable supply of public water available throughout the area would effectively prevent unacceptable human exposure to COCs in groundwater. As the impacted areas would naturally be remediated by this alternative, it is likely that the use restrictions would be required to remain in effect for an indefinite period. Groundwater monitoring would be performed to confirm that natural attenuation is occurring.

Reduction of TMV through Treatment

Implementation of institutional controls and monitored natural attenuation would not reduce the TMV of COCs through active treatment. However, natural biological, chemical, and physical processes may continue to gradually reduce concentrations of certain substances. An MNA study would be required as MNA was not elevated in the RI. It is noted that, in general, VOC concentrations decreased during the RI resulting in some VOCs being in compliance with ARARs.

Short-Term Effectiveness

Decreasing COC concentrations were observed over an 11-month period in the RI indicating short-term effectiveness likely due to natural biological, chemical, and physical processes. The implementation of this alternative would entail minimal risk of human exposure to COCs in groundwater, with the greatest contribution to this risk resulting from occasional groundwater sampling and the installation of additional monitoring wells as needed. Such risks would be minimized by following appropriate health and safety requirements.

Implementability

This alternative would be easily implemented, as certain lots/areas already have these restrictions. Regular inspections would be performed to verify compliance with the requirements of the CEAs and WRAs, and routine groundwater monitoring would be performed. Disruption to business would be minimal.

Cost

The capital cost for this alternative is \$683,500. The annual O&M cost, which is primarily related to performance of routine site inspections and groundwater monitoring, is \$81,300. The present worth cost of this alternative is \$2,276,000 for 30 years.

6.2.3.4 Groundwater Alternative 4 – Institutional Controls and Containment

This alternative combines the CEA and WRA components of Groundwater Alternative 2 with the installation of a vertical barrier around the Site to isolate contaminated groundwater from the environment and reduce potential hydraulic communication with off-site surface water. A geotechnical investigation of wall alignment would be performed. Additionally, unpaved portions of the Site would be covered with a single-layer impermeable cap, and existing paved areas would remain intact to reduce infiltration of precipitation and flood water. Appropriate deed restrictions would be implemented to prevent disturbance of the cap and vertical barrier.

Overall Protection of Human Health and the Environment

Through the maintenance of existing CEAs and WRAs at the Site, designation of additional CEAs and WRAs for the remainder of the Site, and installation of a cap and vertical containment barrier, this alternative would prevent exposure to COCs in groundwater and reduce the potential for discharges of groundwater containing COCs to surface water. Groundwater quality would not be restored, although natural biological, chemical, and physical processes may continue to gradually reduce concentrations of certain substances.

Compliance with ARARs

By providing institutional controls restricting the use of groundwater and thereby eliminating the exposure pathway, along with containment to prevent the potential migration of COCs in groundwater, compliance with action-specific ARARs may be achieved. This alternative would not comply with chemical-specific ARARs associated with the restoration of groundwater.

Long-Term Effectiveness and Permanence

If complied with, groundwater use restrictions in combination with the existing reliable supply of public water available throughout the area would effectively prevent unacceptable human exposure to COCs in groundwater. As the groundwater would not be remediated by this alternative, it is likely that the use restrictions would be required to remain in effect for an indefinite period. The cap and vertical containment would also effectively prevent the potential migration of COCs in groundwater, including discharges to surface water. A slurry wall on the eastern boundary would likely have



soil and groundwater with COCs outside of the containment, as the wall likely would be built offset from the river. Monitoring of groundwater levels inside and outside the containment would be required to ensure a build-up of water pressure inside the containment does not reduce the effectiveness of the containment barriers.

Reduction of TMV through Treatment

Implementation of institutional controls and installation of containment systems would reduce the mobility of COC, although not by treatment. Toxicity and volume of COC would not be affected. However, natural biological, chemical, and physical processes may continue to gradually reduce concentrations of certain substances.

Short-Term Effectiveness

This alternative would involve approximately 6 to 10 months of on-site construction operations (assuming no building demolition), which would increase local traffic due to the commute of construction workers, transportation of construction equipment, and importing of containment system materials. Protection of the workers and the surrounding environment and community during installation of the cap and vertical containment barriers can be achieved by adhering to OSHA standards for construction and hazardous waste work, including air monitoring and dust control measures.

Implementability

Installation of the vertical containment barrier, whether in the form of a slurry wall or sheet pile, would be challenging to implement, as it would require installation of the barrier to completely surround the Site. Containment wall may require building(s) demolition depending on wall alignment. Given the numerous underground utilities at the Site and the proximity of several buildings to the property line and roadways to the west, it is uncertain whether an effective barrier can be constructed along much of the western boundary of the Site. Construction of the cap would require coordination with existing businesses and anticipated redevelopment plans, if available at the time of remedial design. Installation of a containment wall would be disruptive to ongoing business operations because every lot would be impacted by wall installation. Access on the west boundary may be needed from adjacent property owner(s). Refer to Soil/Fill Alternative 3 for implementability associated with capping.

Regular inspections would be performed to verify compliance with the requirements of the CEAs and WRAs, and routine groundwater monitoring would be performed.

Cost

The capital cost for this alternative is \$11,486,700, assuming a sheet pile barrier. The annual O&M cost, which is primarily related to performance of routine site inspections, cap maintenance/resurfacing, and groundwater monitoring, is \$125,000. The present worth cost of this alternative is \$13,937,000 for 30 years.

6.2.3.5 Groundwater Alternative 5 – Institutional Controls and In-Situ Remediation

Alternative 5 includes the CEA and WRA components described for Groundwater Alternative 2. A focused in-situ remediation of potential source area(s) (i.e., UST area) in combination with MNA (Groundwater Alternative 3) are other components of this alternative. The most appropriate in-situ treatment approach will be selected as part of the remedial design. Treatability and/or pilot studies would be considered in remedial design to select the appropriate in-situ treatment approach/reagent. If LNAPL is observed in groundwater (outside of the UST area), this alternative would include remedial measures to address the LNAPL. Based on RI findings, LNAPL remedial measures are not warranted.



Overall Protection of Human Health and the Environment

Through the maintenance of existing CEAs and WRAs at the Site, designation of additional CEAs and WRAs for the remainder of the Site, and in-situ treatment of VOCs, this alternative would prevent exposure to COCs. However, overall groundwater quality would not be restored, as inorganic COCs would not be addressed. In-situ remediation would not eliminate the need for institutional controls.

Compliance with ARARs

By providing institutional controls restricting the use of groundwater and thereby eliminating the exposure pathway, along with treatment to reduce the migration of organic COCs in groundwater, compliance with action-specific ARARs may be achieved. This alternative could comply with chemical-specific ARARs for COCs amenable to in-situ treatment (VOCs), but not for other COCs (metals).

Because soil/fill below the water table contains metal COCs, their sources in addition to a natural source are likely historic fill which may have been impacted by current or past releases(s). This results in some COC concentrations in groundwater not being reduced to below PRGs for a long period. Other alternatives including waste removal, capping, or excavation of contaminated soil reduce lead infiltration into groundwater from unsaturated soils. Groundwater would be monitored until PRGs for COCs are met.

Long-Term Effectiveness and Permanence

If complied with, groundwater use restrictions in combination with the existing reliable supply of public water available throughout the area would effectively prevent unacceptable human exposure to impacted groundwater. As the impacted groundwater would not be remediated for all COCs by this alternative, it is likely that the use restrictions would be required to remain in effect for an indefinite period.

Reduction of TMV through Treatment

Performance of in-situ remediation would reduce the TMV of certain COCs in groundwater by treatment, but would not significantly alter the TMV of other COCs (metals).

Short-Term Effectiveness

This alternative would initially involve approximately 4 to 6 weeks of on-site construction operations, including injection or sparging and monitoring well installation. Follow-up injections or operation of sparging systems and regular groundwater monitoring may continue for an additional 6 months to 5 years, with continued groundwater monitoring beyond that timeframe. Protection of the workers and the surrounding environment and community during these activities can be achieved by adhering to OSHA standards for construction and hazardous waste work. Design of an injection remedy should address the potential for loss of reagents to the river.

Implementability

Implementation of this alternative is feasible, as providers of these services are available. Operations would have to be coordinated with ongoing business operations at the Site. Implementability of an in-situ remedy may be affected by on-Site hydrogeological conditions with respect to ability to deliver reagents to the aquifer or the radius of influence of sparging wells. Regular inspections would be performed to verify compliance with the requirements of the CEAs and WRAs, and routine groundwater monitoring would be performed. Based on current site businesses and depending on the work areas, disruption of businesses ranges from minimal to moderate.

Cost

The capital cost for this alternative is \$1,913,300, assuming in-situ chemical oxidation. The 30-year O&M cost, which includes routine groundwater monitoring, is \$81,300. The present worth cost of this alternative is \$3,506,000 for 30 years. Alternate treatment methods are expected to have similar present worth costs.

6.2.4 Sewer Water

6.2.4.1 Sewer Water Alternative 1 – No Action

Overall Protection of Human Health and the Environment

The No Action alternative would not provide protection of human health and the environment since no action would be taken to remove impacted water and solids from Manhole 8 and associated piping. This alternative would not meet the RAOs.

Compliance with ARARs

This alternative would not comply with chemical-specific ARARs.

Long-Term Effectiveness and Permanence

The No Action alternative does not provide long-term effectiveness and permanence since the water and solids in the sewer would not be addressed. There would be no change to the magnitude of potential impacts since no action would be taken to reduce or remove the materials. The No Action alternative provides no controls of the materials nor any measures to control potential human health risks. The No Action alternative would not provide any mechanism to monitor the potential release of the materials.

Reduction of TMV through Treatment

No reductions of contaminant TMV through treatment would be achieved under this alternative. There is no provision in this alternative to remove the sewer materials.

Short-Term Effectiveness

Since no remedial action would be implemented, this alternative would not pose a short-term impact to on-site workers or the local community.

Implementability

An evaluation of the implementability of the no-action alternative is not applicable, as no action is taken.

Cost

The no-action alternative has no capital costs over the 30-year project life, and five-year review costs are included in the Waste alternative estimates. Thus, this alternative has no present value.

6.2.4.2 Sewer Water Alternative 2 – Removal and Off-Site Disposal

This alternative consists of the transfer of the water and solids into appropriate containers or transport vehicles for off Site treatment and/or disposal.

Overall Protection of Human Health and the Environment

This alternative would provide protection of human health and the environment, as the sewer materials would be removed from the Site, thereby eliminating the potential exposure to the waste, release of the materials to the environment, or potential discharge of sewer water COCs to surface water.

Compliance with ARARs

This alternative would comply with ARARs. Location- and action-specific ARARs would be met by following appropriate health and safety requirements and complying with necessary regulations and permits, including disposal of removed materials at an authorized off-site TSD facility.

Long-Term Effectiveness and Permanence

This alternative would provide long-term effectiveness and permanence by removal of the sewer material and filling of the manhole and associated line. The magnitude of the residual risk would be minimal, and no wastes requiring continuing controls would remain.

Reduction of TMV through Treatment

This alternative would reduce the mobility of the sewer material through removal and appropriate off-Site disposal. The toxicity and volume of the material would not be affected by treatment.

Short-Term Effectiveness

This alternative would involve approximately 1 week of on-site construction operations. Protection of the workers and the surrounding environment and community during removal and filling can be achieved by adhering to OSHA standards for construction and hazardous waste work.

Implementability

Removal of the sewer materials and filling of the manhole and piping is readily implementable, as equipment and experienced vendors for this type of work are available. Disruption of current business would be minimal.

Cost

The capital cost for this alternative is \$26,300. There would be no O&M costs associated with this alternative. The present worth cost of this alternative is \$26,300 for 30 years.

6.2.5 Soil Gas

6.2.5.1 Soil Gas Alternative 1 – No Action

Overall Protection of Human Health and the Environment

The No Action alternative would not provide protection of human health since no action would be taken to prevent COCs in soil gas from migrating to indoor air, although at the present time there are no associated exposures. Natural



processes may gradually reduce COC concentrations in soil; however, no monitoring of soil would be performed to confirm this reduction.

Compliance with ARARs

This alternative would not comply with ARARs, as no action would be taken to address COCs in soil gas.

Long-Term Effectiveness and Permanence

The No Action alternative does not provide long-term effectiveness and permanence since COCs in soil gas would not be addressed. The No Action alternative provides no measures to control or monitor for the potential migration of soil gas to indoor air.

Reduction of TMV through Treatment

No reductions of contaminant TMV through treatment would be achieved under this alternative. There is no provision in this alternative to address soil gas. However, natural biological, chemical, and physical processes may gradually reduce concentrations of certain COCs.

Short-Term Effectiveness

Since no remedial action would be implemented, this alternative would not pose a short-term impact to on-Site workers or the local community.

Implementability

An evaluation of the implementability of the no-action alternative is not applicable, as no action is taken.

Cost

The no-action alternative has no capital costs over the 30-year project life, and five-year review costs are included in the Waste alternative estimates. Thus, this alternative has no present value.

6.2.5.2 Soil Gas Alternative 2 – Institutional and Engineering Controls

This alternative consists of establishing or enhancing deed notices and/or CEAs on the affected lots to provide certain restrictions upon the use of the property, requiring assessing and/or addressing the potential for vapor intrusion prior to occupying existing vacant buildings or constructing new buildings on those lots. The assessment will determine if engineering controls are required.

Overall Protection of Human Health and the Environment

Through the recording and maintenance deed restrictions and CEAs on the affected lots, this alternative would be protective of human health, as it would require assessing and, if needed, mitigating vapor intrusion risks in existing buildings prior to occupancy, and establishing required protective measures for new construction. Natural processes may gradually reduce COC concentrations in soil; however, no monitoring of soil would be performed to confirm this reduction.

Compliance with ARARs

This alternative would comply with ARARs for addressing potential vapor intrusion.

Long-Term Effectiveness and Permanence

Requirements for assessing and mitigating vapor intrusion risks for existing and future buildings on the affected lots would be effective. Regular site inspections would be required to confirm and document continued compliance with the requirements.

Reduction of TMV through Treatment

No reductions of contaminant TMV through treatment would be achieved under this alternative, except where active (electro-mechanical) mitigation of vapor intrusion is determined to be necessary and treatment of vapors performed.

Short-Term Effectiveness

Short-term risks for this alternative would be limited to those associated with the collection of vapor samples and, if needed, installation of engineering controls. These risks are readily controlled by following appropriate health and safety practices.

Implementability

This alternative is implementable and requires owner/tenant cooperation. If engineering controls are required for an existing building, design testing may be required. Regular inspections would be required to verify continued compliance with the requirements of this alternative. Disruption to businesses ranges from minimal to moderate.

Cost

The capital cost for this alternative is \$46,700. The annual O&M cost, which is primarily related to performance of routine site inspections, is \$6,250. The present worth cost of this alternative is \$169,000 for 30 years.

6.2.5.3 Soil Gas Alternative 3 – Institutional Controls and SSDS

This alternative consists of recording and maintenance of deed notices and/or CEAs on the affected lots (Lots 58, 62, and 68) as described for Soil Gas Alternative 2. In addition, an active SSDS would be installed for each of the existing occupied buildings on the affected lots within the limits of potential vapor intrusion, with off-gas treatment if required.

Overall Protection of Human Health and the Environment

Through the maintenance and enhancement of existing deed restrictions and CEAs on the affected lots, as well as the installation of an SSDS in each of the affected buildings and certain requirements for future construction, this alternative would be protective of human health. Natural processes may gradually reduce COC concentrations in soil; however, no monitoring of soil would be performed to confirm this reduction.

Compliance with ARARs

This alternative would comply with ARARs for addressing potential vapor intrusion.

Long-Term Effectiveness and Permanence

Requirements for mitigating vapor intrusion risks for existing and future buildings on the affected lots would be effective. Regular site inspections would be required to confirm and document continued compliance with the requirements and proper operation of SSDS.



Reduction of TMV through Treatment

No reductions of contaminant TMV through treatment would be achieved under this alternative, except where mitigation of vapor intrusion is determined to be necessary and treatment of vapors collected by an SSDS is performed.

Short-Term Effectiveness

Short-term risks for this alternative would be limited to those associated with the collection of vapor samples and installation of SSDSs. These risks are readily controlled by following appropriate health and safety practices.

Implementability

This alternative is implementable and require owner/tenant cooperation. For the existing buildings, testing to determine appropriate vapor collection point spacing and fan size may be required. Regular inspections and sampling would be required to verify continued compliance with the requirements of this alternative. Business disruption would be minimal to moderate.

Cost

The capital cost for this alternative is \$87,000. The annual O&M cost, which is primarily related to performance of routine site inspections and SSDS operation/monitoring, is \$10,600. The present worth cost of this alternative is \$295,000 for 30 years.

6.3 Comparative Analysis of Alternatives

The comparative analysis section evaluates how each of the remedial alternatives achieves the evaluation criteria relative to one another. To compare the alternatives, ratings of poor, fair, good, or excellent were assigned to each of the evaluation criteria used in the analysis of the alternatives.

6.3.1 Waste

In terms of overall protectiveness, compliance with ARARs, long-term effectiveness, and reduction of TMV, Alternative 2 (removal and off-site disposal) is rated better than Alternative 1 (no action), which rates poorly in each of those categories. In terms of short-term effectiveness, implementability, and cost, Alternative 1 rates better as no action is taken.

6.3.2 Soil/Fill

Compliance with chemical-specific ARARs for some COCs may not be feasible due to the nature of the soil/fill. Up to 15 feet of NJDEP defined historic fill exists beneath the Site. The sources of fill are unknown. As fill placement occurred over a more than 30-year period, the sources and thus physical and chemical properties could be different. The fill material consists predominantly of sands, silts, and gravel along with man-made materials such as brick, pieces of concrete block, wood, glass, and cinders. The fraction of each material in the fill varies across the Site. When a COC is related to natural conditions or historic fill, it is ubiquitous in the soil/fill, like background concentrations, likely resulting in non-compliance with chemical-specific ARARs regardless of alternative. In terms of protectiveness, compliance with ARARs, and long-term effectiveness, Alternatives 3 (cap and bulkhead enhancement), 5 (hot spot excavation/disposal with capping) and 6 (in-situ remediation) rate better compared to the remaining alternatives, with Alternative 6 also rating better for reduction of TMV by treatment. However, Alternative 6 does not eliminate capping needed to meet the chemical-specific ARARs (PRGs).

Alternative 1 (no action) would not meet the chemical-specific ARARs since no action would be taken. Alternative 2 (institutional controls and limited action) would not meet chemical-specific ARARs other than institutional controls. Alternatives 3, 5 and 6 would comply with the chemical-specific ARARs and would meet the PRGs since contaminated soil would be treated, contained or removed from the Site. Chemical-specific ARARs for Alternative 4 (excavation and off-site disposal) would be met for shallow soil via removal of soil containing COCs but may not meet ARAR for the deeper contaminated soil. Location- and action-specific ARARs are met by Alternatives 3 through 6.

Alternative 3 rates the best for minimizing human and ecological exposure to soil/fill and preventing off-site transport of soil containing COCs. Not including the No Action alternative, Alternative 2 (limited action) rates best for short-term effectiveness, implementability, and cost. Alternatives 3 through 6 provide similar long-term effectiveness with Alternatives 4 through 6 providing better permanence due to excavation/disposal or in-situ treatment.

Alternatives 2 through 6 have similar long-term O&M obligations through institutional controls. Other than No Action alternative, none of the soil/fill alternatives reduce these obligations to less than 30 years assumed in the FS process.

Not including the No Action alternative, Alternative 2 rates best for short-term effectiveness, implementability, and cost.

6.3.3 Groundwater

Groundwater Alternatives 3 through 5 are similar in terms of overall protectiveness, compliance with ARARs, long-term effectiveness, and reduction of TMV, largely due to the challenge of addressing metals in groundwater within soil/fill. For reduction of TMV, Alternative 5 (in-situ) rates better in the short term because potential source areas are treated. However, tidal influences on in-situ treatment may negatively impact this rating.

Alternative 1 would not meet the chemical-specific ARARs since no action would be taken. Location- and action-specific ARARs are met by Alternatives 3 through 5.

In terms of the implementability and cost, Alternatives 2 (institutional controls) and 3 (MNA) rate the best, while Alternative 4 (containment) rates the worst. Alternative 5 (in-situ) rates the best for short-term effectiveness for some COCs. Alternatives 2 through 5 have similar long-term O&M obligations through institutional controls. None of these four groundwater alternatives eliminate O&M obligations to less than 30 years assumed in the FS process. Under Alternatives 3 through 5 (pending MNA suitability determination), O&M obligations related to groundwater organic COCs would diminish within 30 years.

6.3.4 Sewer Water

In terms of overall protectiveness, compliance with ARARs, long-term effectiveness, and reduction of TMV, Alternative 2 (removal and off-site disposal) is rated better than Alternative 1 (no action), which rates poorly in each of those categories. In terms of short-term effectiveness, implementability, and cost, Alternative 1 rates better as no action is taken.

6.3.5 Soil Gas

Alternatives 2 (institutional and engineering controls) and 3 (SSDS) rate similarly excellent in terms of overall protectiveness, compliance with ARARs, and long-term effectiveness, with Alternative 2 rating slightly better than 3 in the remaining criteria due to the higher cost associated with Alternative 3.

6.4 Cross-Media Effects

It is noted that although alternatives for each site medium were evaluated independently of alternatives for other media, the selection and implementation of specific alternatives for certain media may enhance, overlap, or otherwise render irrelevant specific alternatives for other media. Specific examples of this include the following:

- Soil/Fill Alternatives 4 and 6 could include the removal or treatment of VOC-impacted soils on Lots 58, 62, and 68, which could effectively address the potential risks associated with soil gas migration to indoor air at those lots, thereby eliminating the need for Soil Gas Alternatives 2 and 3.
- The removal of UST and their contents under Waste Alternative 2 removes a potential groundwater source. This action will result in improved groundwater quality, reducing the potential benefit associated with Groundwater Alternative 5.
- Similarly, Soil/Fill Alternatives 4, 5, and 6 could also result in improved groundwater quality, reducing the potential benefit associated with Groundwater Alternative 5.
- Soil/Fill Alternative 3 and Groundwater Alternative 4 both include the installation of a low-permeability cover over most of the Site, and as such, the scope and costs for these alternatives may overlap.

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APPENDIX A: SOIL AREA/VOLUME DELINEATION INFORMATION



APPENDIX B: COST TABLES



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